MEDICINE SURGERY

INDUSTRIAL HEALTH
OCCUPATIONAL DISEASES
TRAUMATIC, INDUSTRIAL

INDUSTRIAL HYGIENE
INDUSTRIAL MEDICINE
& RAILROAD SURGERY

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WE ARE MOVED this month to let the contents of this issue—the first number of the thirteenth volume of INDUSTRIAL MEDICINE—speak for themselves. They have much to say, and careful thought concerning what they say will reveal more, for there are timely and permanent values implicit in every paragraph. Confident, therefore, that they need no introduction, we can note some of the phenomena with which the news, comment and opinion abound—both as briefed in the news pages here, and as they appear in the current press. First, is the extract from a report of the George S. May Foundation on Absenteeism (page 22). The official mind clings to the belief that the public is only a large number of little Audreys. But the official pronouncements on absenteeism have become so impossible that, at last, "even little Audrey knows" they are fantastic. If such pronouncements are intended as a reproach to either management or labor, it should be remembered, as DR. LYNCH remarked in his really authentic study of absenteeism (INDUSTRIAL MEDICINE, September, 1943, p. 575), that "Human nature does not change so rapidly, and, the dreamers having taught it to loaf, it is difficult for management now to unteach it." . . . NEXT, is the OWI comment on labor turnover (page 16). These figures may be accurate enough, but even so they should not be applied to more plants than the 16,900 they came from. And they might be weighed in the light of the effect of the real or fancied symptoms of ill health referred to on page 68. The important fact is that in war production there are more absenteeisms and turnover than there would be under peacetime conditions. The long range view of this will disclose that it is inevitably so, and the longe range evaluation will conclude "what of it?"—especially since the war production record of industry has become so astounding. The National Association of

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Manufacturers recently issued a pamphlet describing this response of industry to the war demands. The figures are almost unbelievable; and the record was made *in spite* of the unusual absenteeism and labor turnover. Nowhere in this pamphlet, however, is it properly stressed that this record was made by industry because (1) it *could* make it, (2) it *wanted* to make it, and (3) it *did* make it from and out of and because of its own organization and existence *as American industry*, and not because of any elements of governmental or political management or control. The point is that industry needs a press agent as frequently and purposefully vocal as any of the government agencies which, without doubt, will arrogate to themselves the credit for the whole business. Along this line, and intimately applicable to the area of our immediate interest, is the statement of DRS. MCCONNELL and FLINN (p. 66) to the effect that most of the features of the industrial-medical set-up in one of the Ordnance plants are "adaptable to American industry generally." With all due respect to the authors, it would have been more fair to preface this statement with the acknowledgement that most of these features were also "adapted from American industry specifically," as, of course, they were. . . . THEN there are the "crocodile tears," as it were, of the Secretary of Labor concerning the possibility that pre-employment medical examinations, if made compulsory, will lead to restriction of personal liberty (p. 24). This from an administration which has been trying to habituate the country to a New Deal definition of personal liberty! . . . . WE ARE also intrigued by the news item (page 14) to the effect that the President "called for more cafeterias, rest rooms and locker facilities." It reminds of the long and too often unsuccessful efforts of many industries to get the necessary priorities so that these things could be provided—together with certain other facilties, including even those for inside toilet rooms for women employees. But neither the needs, nor the unnecessary and tangled red tape to apply for them, nor the arbitrary arrogance with which they were referred, or deferred, or turned down, were of sufficient importance to get into the news. The school-book mythology records only that "Jove nodded," and things be-

—*Continued on page 98.*

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Pneumococcus (Diplococcus pneumoniae)	2,000 million
Streptococcus (hemolytic and non-hemolytic)	2,000 million
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PERSONAL

DR. RICHARD MILTON MAY, of Hobart, Indiana, has been appointed assistant surgeon for the Carnegie-Illinois Steel Company, at Gary.

DR. DE WITT LOOMIS, of Boonville, Indiana, has been appointed to the medical staff of the Southern Railway, and is now acting company surgeon at Boonville.

DR. BARNEY J. HEIN, Toledo, chairman of the Committee on Industrial Health of the Ohio State Medical Association, was in Washington, D. C., November 10 for a public hearing of a sub-committee of the Committee on the Judiciary of the House of Representatives, on H.R. 786, the Tolan bill to permit chiropractors to treat beneficiaries of the U. S. Employees' Compensation Act. DR. HEIN was one of the two witnesses who appeared at the request of the American Medical Association in opposition to the enactment of the bill.

DR. F. G. BARR, Director of Industrial Relations, National Cash Register Company, Dayton, Ohio, spoke on "Problems and Obstacles in Industrial Recreation" at the Industrial Recreation Clinic held in Philadelphia, January 6 and 7, 1944. The clinic was conducted by outstanding national authorities in the field of employee activity programs, and was sponsored by the University of Pennsylvania, and the Philadelphia Chamber of Commerce, Board of Trade, and Industrial Relations Association. Cooperating agencies were the Philadelphia Safety Council and Purdue University.

DR. GEORGE A. SHIPMAN, commissioned as Assistant Surgeon, U. S. Public Health Service, October, 1943, has been made Director, Industrial Hygiene Division, Alabama Department of Public Health. As reserve officer, U.S.P.H.S,, he went on active duty April, 1942, at the National Institute of Health, Division of Industrial Hygiene, Bethesda, Maryland, whence he was transferred to the Industrial Hygiene Service of the Georgia State

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Department of Public Health. There he served in the capacity of assistant to DR. L. M. PETRIE, Director of the Industrial Hygiene Service from July, 1942, to October, 1943. DR. SHIPMAN graduated B.A. at the University of Colorado in 1936, and M.D. at the University of Colorado School of Medicine in 1941, serving his internship at City Hospital, New York City. During his training at the University of Colorado, DR. SHIPMAN was a student and friend of the late DON CUMMINGS.

DR. J. H. J. UPHAM, Columbus, Ohio, dean emeritus of the Ohio State University College of Medicine, and a past-president of the American Medical Association and the Ohio State Medical Association, spoke on "Vitamins" at the eighth annual conference of the Du Pont Medical Division, November 10, at Wilmington, Delaware. Approximately 60 physicians from the various Du Pont plants throughout the country attended.

—*Ohio State M. J.*, December, 1943.

DR. C. O. SAPPINGTON spoke at a luncheon meeting of the Will-Grundy County Medical Society, Joliet, Illinois, December 10, 1943. His subject was "Industrial Medicine and Private Practitioners." The arrangements were made under the auspices of the Educational Committee of the Illinois State Medical Society.

HERBERT T. WALWORTH reported for duty with the Industrial Hygiene Service of Tennessee on November 22, 1943, as Chief Industrial Hygiene Engineer. Prior to that time he was employed by the Montana State Board of Health for three and a half years as Director, Industrial Hygiene Division. He also had been engaged in the Bureaus of Industrial Hygiene of the Michigan and Detroit Health Departments.

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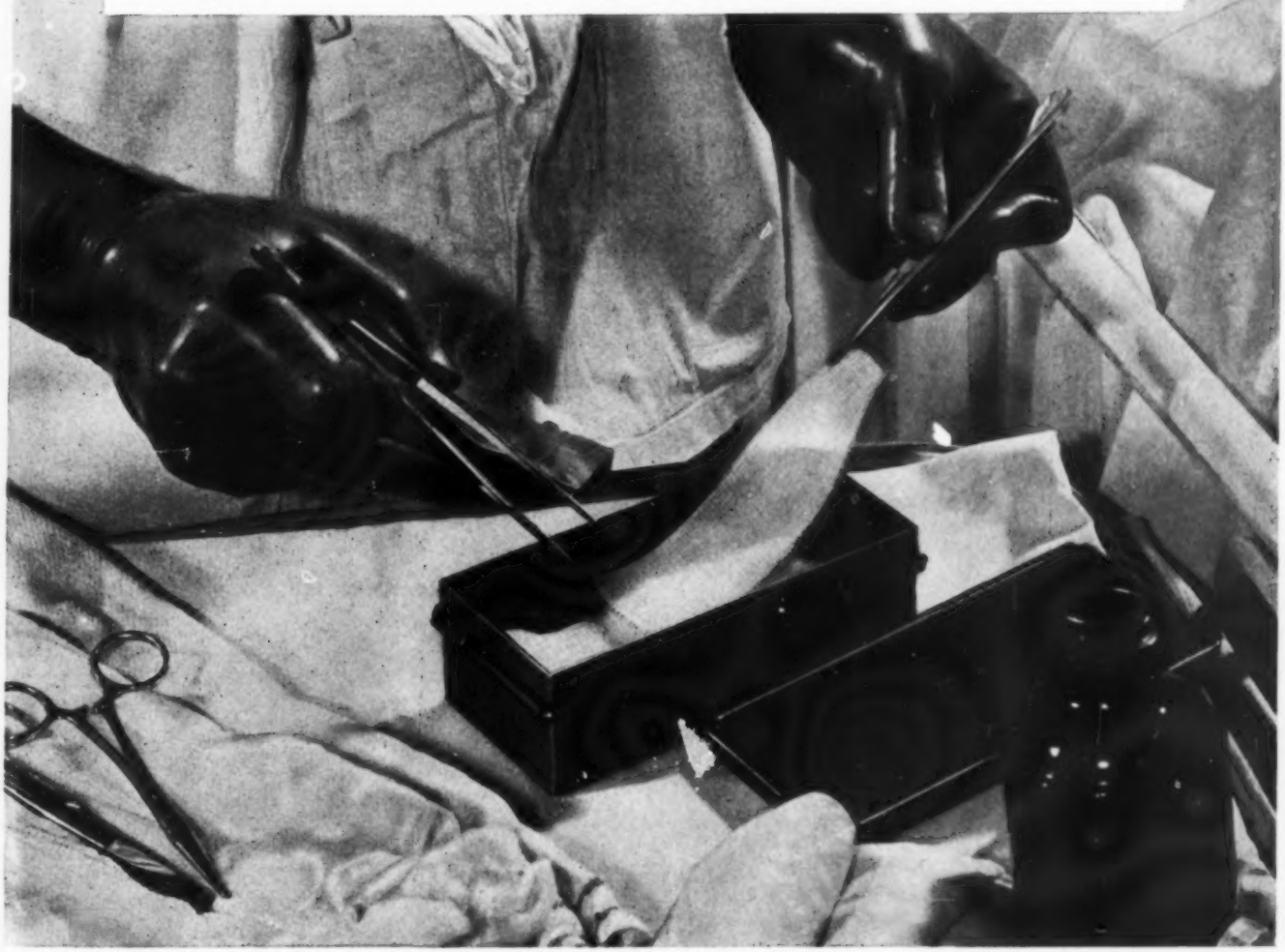

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1. Brit. M. J. 2:223 (Aug. 21) 1943.
2. Ann. of Surg. 117:885 (June) 1943.
3. J.A.M.A. 122:909 (July 31) 1943.
4. Surg., Gynec. and Obst. 74:914 (May) 1942.

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Venereal Disease Meeting

SENIOR SURGEON COMMANDER OTIS L. ANDERSON, M.D., Assistant Chief, Division of Venereal Diseases, U. S. Public Health Service, and DR. HERMAN N. BUNDESEN, President, Chicago Board of Health, will speak at the luncheon meeting of the Chicago Association of Commerce War Problem School's January session of the series on "How to Handle Manpower Problems." COMMANDER ANDERSON will discuss: (1) The extent of venereal diseases in industry and their effect on production: How these relate to management's need for manpower—Effect of untreated venereal disease on skill of an employee and his span of working life —How war effort and public are con-

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cerned. (2) What persons infected with venereal disease may be safely employed: What to do with the person having venereal disease at time of pre-employment examination — How infectious persons may be treated and rendered non-infectious and safe for employment — Frequency of re-examination of employees and recommendations for employing, treating, and official reporting of those having a venereal disease. DR. BUNDESEN will discuss: (1) Health facilities in Chicago to control venereal disease of industrial workers: Free laboratory analysis of blood specimens—Free clinics for examination and treatment—Free intensive treatment and hospitalization of infectious cases—Public Health staff for medical consultation—Education program; lecturers, discussion

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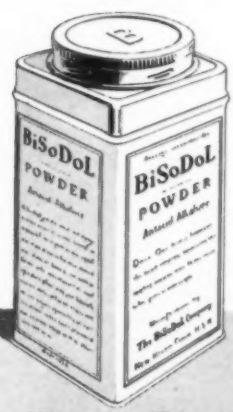

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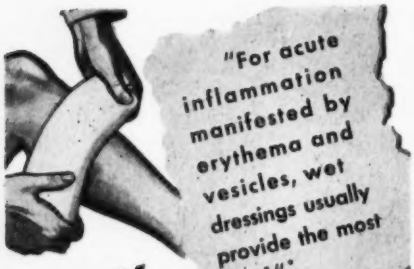

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*Schwartz, L., Med. Dir., U. S. Public Health Serv.: Manual of Indust. Hygiene, 1943, p. 174.

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GENERAL

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AS EVIDENCE of the unprecedented burden of work now being borne by industrial physicians, DR. CLARENCE D. SELBY, speaking at the recent Wartime Public Health Conference of the American Public Health Association, in New York City, cited an industrial plant whose employees have increased more than 100% yet whose doctors have increased less than 11%—from 115 to 127. The condition is doubly appalling, DR. SELBY said, in view of the fact that a number of the concern's new employees are over-age, physically handicapped or both.

—*Medical Economics*, December, 1943.

TO ENCOURAGE women to work and keep working in war industries, the President, on December 22, called for more cafeterias, rest rooms and locker facilities. He ordered the War and Navy secretaries and the Maritime Commission to make available funds and materials necessary to provide the facilities in plants under their jurisdiction. And, so that similar facilities may be provided in private plants, he requested the War Production Board to grant prompt allocations of the necessary materials. It is said he acted as a result of conferences with industrialists.

—News Item.

British Journal

THE *British Medical Journal* announces the publication commencing next January of an addition to the specialist journals published by the British Medical Association—the *British Journal of Industrial Medicine*. The project has often been discussed in recent years, and the final stimulus to action came in the shape of a formal request to the British Medical Association from the Association of Industrial Medical Officers. An editorial board was formed, and it was intended that Sir Henry Bashford, chief medical officer of the post office, would be editor in chief, but his recent appointment as medical adviser to the treasury prevents this. It is anticipated that Dr. Donald Hunter of the London Hospital will take his place. The other editors will be Dr. A. J. Amor, Dr. M. W. Goldblatt, Dr. D. C. Norris, Dr. Donald Stewart and Mr. R. W. Watson-Jones, a surgeon. The *British Medical Journal* says that since 1939 the country has been overwhelmingly conscious of the extent to which it owes its safety to the health of the worker in industry. Industrial medicine is not just industrial toxicology; in fact, this is but a small part of it. A whole range of problems face the worker, the management and the doctor—the effect on the

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leaders, movies, posters and pamphlets—Legal obligations of employers and doctors; reporting infected cases, recognizing of quarantine cases and other regulations. (2) How Chicago industrial concerns can most effectively use these facilities. A discussion session will be held in the afternoon at which COMMANDER ANDERSON, MAJOR THEODORE BAUER, Director, Chicago Venereal Disease Control Program, and CAPTAIN S. L. PEARLMAN, Medical Director, Venereal Disease Clinics, Chicago, and others will discuss how industrial managers, public and private medical facilities and representatives of labor can work cooperatively to control venereal disease. The sessions will be held at the La Salle Hotel, Monday, January 24, 1944.

FOR DETAILS regarding the Sixth Annual Congress on Industrial Health, Chicago, see page 38.

IN FOILLE BURN THERAPY

Basically, Foille is consistent in its physical characteristics with such currently discussed bland ointments as petrolatum and boric acid gauze dressings.

But, in addition, Foille is augmented by chemical constituents capable of:

(a) markedly controlling pain

(b) consistently avoiding sepsis

and, based upon wide medical experience,

(c) stimulating granulation and epithelization.

Foille is adapted to the same treatment methods used with bland ointments such as open applications, gauze and pressure dressings.

FOILLE

is becoming increasingly important in the treatment of industrial burns. The value of Foille in the management of creosote and magnesium burns is stressed in recent articles.[1,2]

2-oz., 4-oz., pints, quarts, gallons, 5-gallons

1. *Jonas, A. D.: Creosote Burns, Jl. Indus. Hyg. & Tox., Vol. 25, (Nov.) 1943.*
2. *Jarzynka, F. J.: Magnesium in Industry, Indus. Med., 12:427-431, (July) 1943.*

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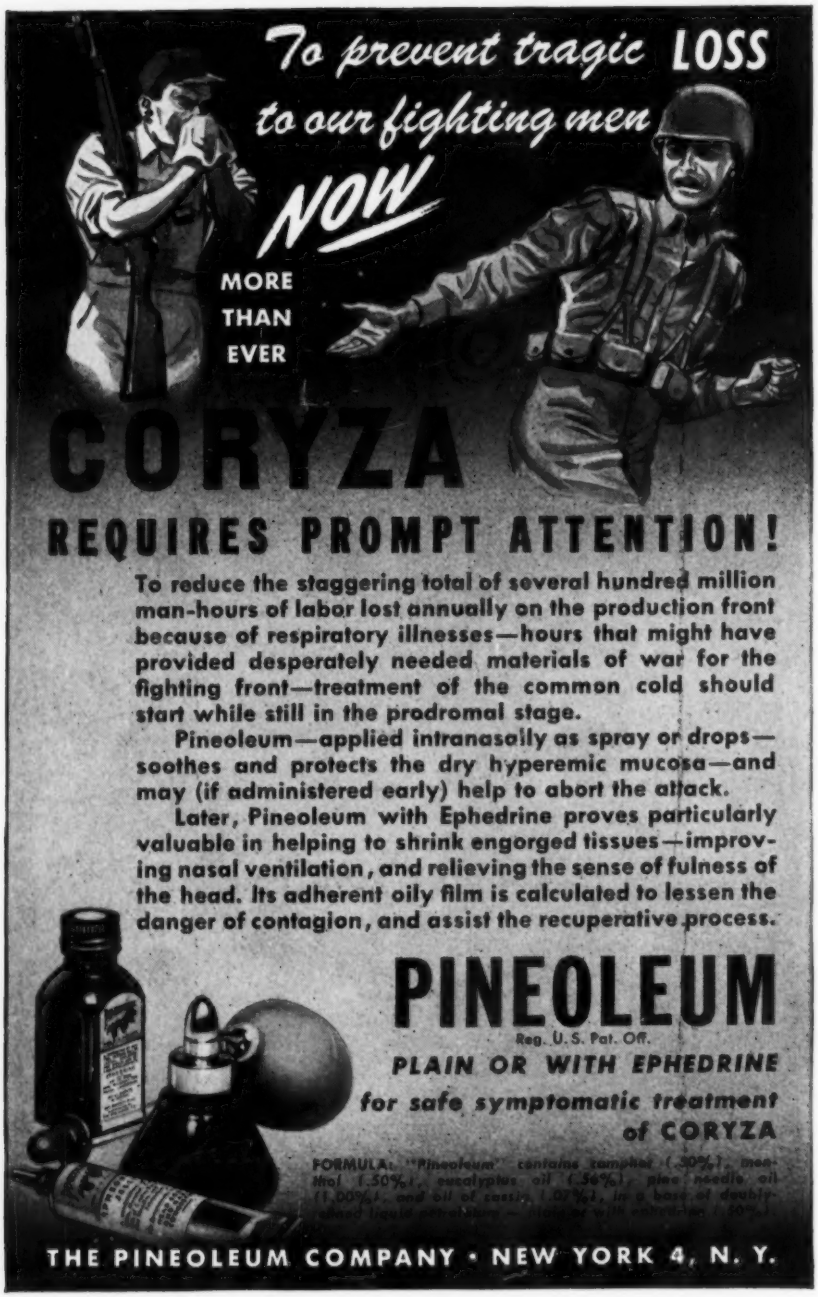
To prevent tragic LOSS
to our fighting men
NOW
MORE
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CORYZA
REQUIRES PROMPT ATTENTION!
To reduce the staggering total of several hundred million man-hours of labor lost annually on the production front because of respiratory illnesses—hours that might have provided desperately needed materials of war for the fighting front—treatment of the common cold should start while still in the prodromal stage.
Pineoleum—applied intranasally as spray or drops—soothes and protects the dry hyperemic mucosa—and may (if administered early) help to abort the attack.
Later, Pineoleum with Ephedrine proves particularly valuable in helping to shrink engorged tissues—improving nasal ventilation, and relieving the sense of fulness of the head. Its adherent oily film is calculated to lessen the danger of contagion, and assist the recuperative process.
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PLAIN OR WITH EPHEDRINE
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worker and his work of temperature and humidity, of the intensity and direction of illumination, of posture and change of posture, of rest pauses and recreation, of washing facilities, of canteens and of an efficient accident service. There are also the important psychologic problems of monotony, relations between foreman and worker, selection of work and so on. From industrial medicine a steady flow of observation and research is hoped for, and much of this should find an outlet in the *British Journal of Industrial Medicine.*

—"Foreign Letters," in *J.A.M.A.*, December 11, 1943.

Shipyard Bulletin

MINE Safety Appliances Company, Pittsburgh, has just issued a new bulletin covering safety requirements in shipyards that are building ships for the Navy and the Maritime Commission. The bulletin is indexed so that it may be used in conjunction with the U. S. Navy-U. S. Maritime Commission Bulletin No. 511314-43-1 "Minimum Requirements for Safety and Industrial Health in Contract Shipyards"; covers all phases of shipyard hazards and protective equipment, including safety hats, head and face protection for welders and many other items; and may be secured on request.

Nutrition Program

NEW ENGLAND Telephone and Telegraph Company has inaugurated a complete nutrition program for its 23,000 employees in the five northern New England states. It is a part of the over-all program designed to keep the health of all employees at a high level during this period of food shortages and rationing, reduce absenteeism attributable to poor nutrition to a minimum, and further the efforts of the Federal and state agencies which are promoting proper nutrition among Americans. Featuring the fundamentals of good nutrition and the value of proper nutrition, the course aids individual employees in planning personal diets, and in planning adequate and tempting menus with special emphasis on diets for those who are underweight and overweight or "let down," probably from want of proper nutrition. In addition, the course gives special instruction on rationing and the use of food alternates. Menus for those on special diets and for box lunches receive special attention.

—From "Solving the Nutritional Problems of Employees in Wartime," by DANIEL L. LYNCH, M.D., F.A.C.S., in *Industry*, October, 1943.

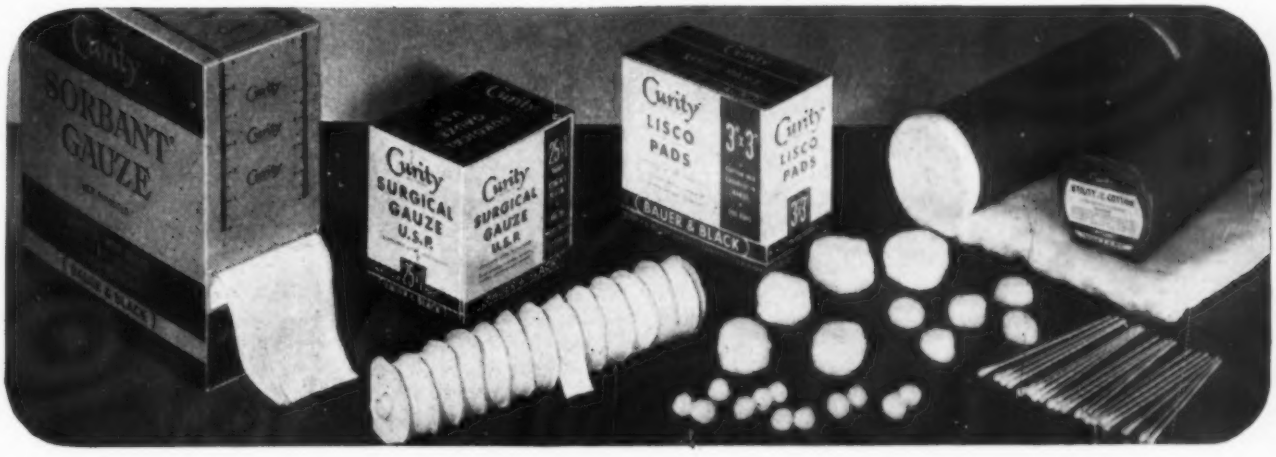
Labor Turnover

OWI REPORTS that the nation's major war plants are finding it necessary to hire 17 workers monthly to get a net increase for three for every 100 employed. . . . Latest WMC reports on turnover come from 16,900 plants, mostly war plants, employing 14,900,000 persons, and cover the month of June. They show that seven out of every 100 workers left their jobs during the month. Five of the seven quit of their own volition; the other two separations are accounted for by layoffs, discharges, military calls, deaths, etc. For every 100 employees, 8.6 new workers were hired, making a net gain of 1.6 workers. . . . More women are quitting their jobs than men. The plants stated that 248,000 women—6.2% of the employment of 4,000,000 in the establishments—quit during June, as compared with 442,000, or 4.1%, of the men. Eight women are leaving the labor market for every 10 persuaded to take employment. . . . . Direct reduction in turnover through remedial action can be traced to plant hiring and exit interviews, improved personnel policies and supervision, improved transportation, better housing, child-care facilities, greater attention to safety and industrial hygiene, dentist and physician service, adequate laundry and dry-cleaning services, recreation, increased personnel consultation for workers, improved feeding facilities both in and near the factory, educational campaigns aimed at showing the worker the importance of his plant to the war effort and of his job to the plant, and manifold other civilian aids and services.

Hernia

THE following rules for determining the compensability of hernia under the Wisconsin Workmen's Compensation Act were prepared at the request of the State Medical Society of Wisconsin by HARRY A. NELSON, Director Workmen's Compensation Division, Wisconsin Industrial Commission: "Under the Wisconsin Compensation Act, hernias may be compensated either on the basis of *accidental* or *gradual* occupational origin. In order to establish *acci-*

ADDED protection of sulfathiazole . . . impregnated into the gauze pad of each Curity SULFA-thiazole HANDI-TAPE. Bauer & Black research originated the method . . . thousands of physicians welcomed the result. For your professional use, we pack a hundred individually wrapped HANDI-TAPES in a flat carton that slips into your bag easily. Each gauze pad is impregnated with sulfathiazole which is released on contact with the moist wound surface.



JUST ONE source of supply furnishes practically every sort of surgical dressing you need. In fact, Curity means a little more than just fine products . . . it means a complete office dressings program—fitted to your practice, your technic . . . your preferences. Curity means plenty of levelheaded research, too, to make sure the things you buy from us are safe . . . and competent. Tell your dealer you'd prefer Curity dressings.

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You Need THIS BIG
POWERFUL LIGHT
THIS beautiful general-purpose Pelton E & O Surgical Light projects its cool, round, 8-inch, feather-edged spot in any direction, and from whatever height, your work demands. It has abundant capacity for cavity penetration and has won preferred rank for use in vaginal and rectal examinations and operations.
Its flood of daylight-quality light is color-corrected and without heat or glare.
Pelton adjustments are easy and instant. New streamlined base provides substantial stability and conceals quiet fiber casters.
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dental hernia, the commission has laid down the following rules, approved by the Supreme Court, in the case of *Meade* v. *Ind. Comm.*, 168 Wis. 250: (1) The accident must be such as could produce a hernia; (2) The hernia must appear immediately after the accident; (3) It must be followed by pain immediately disabling the applicant; (4) The applicant must give immediate notice of injury to the respondent. The commission has concluded that unless these rules are reasonably met, it is speculative to assign causation of hernia to work on an accidental basis. The word 'immediately' is to be construed reasonably in the light of all circumstances . . . To prove hernia as the result of *gradual* process on an occupational basis, it must be shown: (1) That the work was of a character such as to produce intra-abdominal pressure of sufficient severity and over a sufficient period of time to result in hernial protrusion. (2) Other causes not resulting from work must be reasonably excluded, such as continued cough, constipation, or activities apart from work which produce intra-abdominal pressure. The fact of a pre-existing weakness does not exclude a finding of occupational causation. A hernia which actually existed prior to the time of employment will not be attributed to subsequent employment, although strangulation of a pre-existing hernia may be held compensable."

Tuberculosis

OF 35,000 pre-employment films taken by one manufacturing concern in a course of 13 years prior to 1942, there were approximately 700 cases which showed tuberculosis. Of these, 400 were accepted and 300 were so obviously active or questionable that they were not accepted. In order that they might not present a community hazard, the family physician and the local tuberculosis organization were notified in each instance and they were referred to the doctor and the tuberculosis group for treatment. In 1942, 10,323 pre-employment x-ray films were taken, and it was noted that, instead of the average 1.8% of former years, the percentage of films showing definite tuberculosis lesions rose to 4.2%. This can be explained on the basis that every available male applied for employment, men rejected from the armed forces because of old lesions, applicants from submarginal economic areas, a larger percentage of negroes, and many women. As stated above, 421 applicants for employment in 1942 showed tuberculous lesions by x-ray. Of this number, 374, or 89%, were accepted for employment and 47, or 11%, rejected as active or questionable. Of the 374 accepted, 331 were men and 43 were women. Of the 331 men, 271 were 50 years or older and 60 were between 18 and 50. The women were all under 30. In a 10-year period prior to 1942, this concern reported 87 cases of pulmonary tuberculosis with an average employment of 7,000, that is 8.7 cases per annum. During the year 1942 there were nine new cases, all employees who had been at work prior to the war. Of the 374 accepted during 1942, 17 have quit to date for various reasons, but none because of reactivation of their lesions.

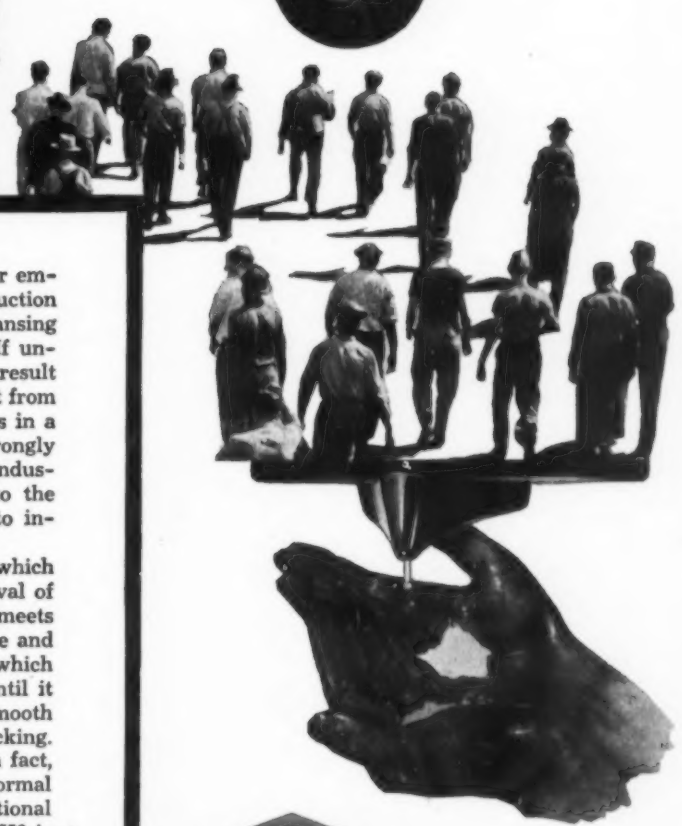
—From "Tuberculosis in Industry," by FRED B. WISHARD, M.D., in *Monthly Bulletin*, Indiana State Board of Health, November, 1943.

Industrial Dental Care

PROGRESS Report on Dental Care for War Workers: The problem of making dental services available for workers in expanded war industrial areas is becoming increasingly acute in many parts of the country. In a section of Georgia where war workers are not able to get dental appointments for even emergency care, one of the larger industries, engaged in war work, asked the assistance of the state health department for a solution to what was one of their major health problems. Following advice from DR. L. M. PETRIE and DR. J. G. WILLIAMS, of the Georgia Department of Public Health, and DR. WILLIAM GARRETT, president-elect of the Georgia State Dental Association, plans are now being completed for the employment

WHERE "Factory Hands"* SAY SLOW pH6 HELPS SIGNAL GO

*Many factory workers have a skin condition which we term "Factory Hands" ...raw, red defatted hands which cause discomfort and embarrassment. If unchecked this irritation may result in dermatitis.



Absenteeism . . . excessive labor turn-over . . . poor employee morale . . . all these handicaps to full production *breed right in the wash-room.* Improper skin cleansing methods often cause or aggravate skin irritation. If unchecked, this irritation occasionally goes so far as to result in dermatitis. Dermatitis accounts for more time lost from work than any other occupational disease. Workers in a hurry to get home often clean their hands with strongly alkaline and abrasive soaps or even with harmful industrial solvents. This practice is in itself harmful to the skin, and at the same time predisposes the skin to inflammation by industrial irritants.

What is needed, obviously, is a *safe* skin cleanser which at the same time is *fast* and *thorough* in the removal of all common types of industrial grime. Stepan pH6 meets these specifications. It speedily removes dirty grease and oil, printing inks, solvents, salves, and even paint which has been on the hands as long as four hours or until it sets. At the same time it leaves the skin clean, smooth and supple, and causes no burning, dryness or cracking. In winter it helps materially to reduce chapping. In fact, pH6 can usually be applied without stinging to normal hands which have been nicked and cut. For exceptional cases of ground-in grime, the cleansing action of pH6 is supplemented by the mechanical "wash-cloth" action of pH6 Non-Abrasive Scrubber.

SPECIAL DISPENSERS INDUCE REGULAR USE

To insure the use of these *safe* materials in place of harsh, harmful skin cleansers, Stepan engineers have developed special dispensing methods, designed for utmost speed and convenience. These special dispensers are adaptable to all wash-room conditions and are also available for use in office or clinic. Write today for *free samples* and circular with complete technical data.

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a new kind of industrial skin cleanser which:

1. Cleans hands quickly and thoroughly.
2. Will not harm the skin.

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ANTISEPSIS WITH MINIMUM OF IRRITATION

in Dermatitis

Discussing the large percentage of dermatologic patients requiring treatment for irritations secondarily infected, Murrell* states: "Practically all of the older antiseptics are irritants and add to the dermatitis. This is true only in a small degree with the sulfonamides locally applied and constitute their chief usefulness."

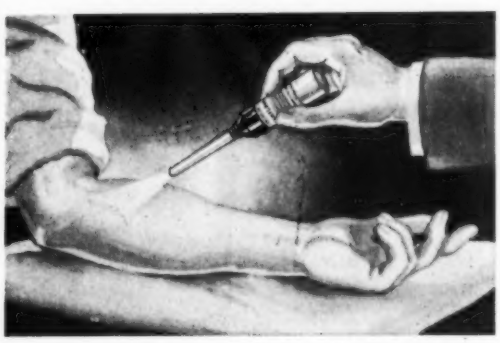
To provide a form of therapy for every topical use, Flint, Eaton provide these dosage forms:

Insufflator Tubes: Sulfanilamide U.S.P. Sulfathiazole U.S.P. In ½ oz. insufflator tubes. (Nozzle attachment available at slight additional cost.)

Sterile Sulfanilamide (Flint) in Double Envelopes: For use in peritoneal cavity or wherever complete sterility is necessary. Contains 5 grams (77 grains) sterile sulfanilamide in fine granular form.

Hydrophilic Base Ointment: Sulfanilamide 5% and 10%; Sulfathiazole 5% and 10%; Sulfatoin Emulsion Base Ointment (Sulfanilamide 10% and Allantoin 2%).

Full information on Flint, Eaton Sulfonamide Products available on request.



*Symposium on the Sulfonamides, Va. Med. Mo., Jan. 1943.

FLINT, EATON & COMPANY

DECATUR, ILLINOIS

of one or more dentists who will give emergency dental service in the plant. In addition, arrangements have been made with the representatives of the local dental society whereby local dentists will set aside evening hours and time on Sundays for war workers appointments. . . . THE Tennessee Department of Public Health, through DR. CARL SEBELIUS, Dental Director, and with the cooperation of the state and local dental societies, has printed local directories of dentists for distribution to plant managements. These contain the names, addresses, and telephone numbers of the local dentists, as well as their office hours. . . . SEVERAL industrial plants in Michigan are making plans to install a dental x-ray service in connection with their programs for industrial medical service. While they feel that no dental program is complete without a clinical examination and emergency service to supplement the roentgenographic findings, it is hoped that the employees will be stimulated to visit local dentists for examination and treatment. This is a beginning for the early recognition and correction of dental defects which if neglected often result in disorders that are medical in character.

—*Industrial Hygiene*, Current News of Official Industrial Hygiene Activities, December, 1943.

Expenses vs. Accident Frequency

IN THE spring of this year the War Production Board conducted a survey of requirements for safety equipment in war industries and essential civilian manufacturing industries. The government learned for the first time, as a result of this survey how much money manufacturing industries spend for safety equipment. All industries surveyed spent on the average of $3.80 per capita employment in 1942. For individual industries the range varies from $6.00 in the chemical industry to $.61 in the tanning and leather industry. Here are employment per capita expenditure figures for safety equipment for each of the following major manufacturing industries: Chemicals, $6.00; merchant ships, $5.75; aircraft manufacturing, $5.22; iron and steel, $5.11; mining, $4.53; stone, clay and glass, $4.40; petroleum, $3.98; machinery, not transportation, $3.50; paper, $3.19; lumber, $1.93; rubber, $1.76; food, $1.75; construction, $.97; textile $.91; public utilities, $.75; tanning and leather, $.61. It is significant that a close correlation exists between the amounts expended for safety equipment and the frequency of accidents. For example, while the chemical industry spends the most, it enjoys one of the lowest frequency rates of the major industries. On the other hand, the lumber industry spends a relatively low amount for safety equipment and has the highest frequency rate.

—From *Facts and Features*, WPB publication.

Manual on Emergency Care

THE immediate care that can be given to injured persons at the site of a disaster and technics of transporting them to safety and medical attention are described in a new manual issued by the Medical Division, OCD. The work is based on procedures and organization developed by the OCD, and careful study of three years of British and other air raid experience. Part I, "Civilian Defense," describes the organization and operation of the field casualty service, which includes mobile medical teams, based on hospitals wherever possible; express parties, made up of a medical team, a rescue squad, an ambulance, and a car for sitting cases, dispatched through the control center to a disaster for immediate action; casualty stations for the care of casualties with minor injuries; stretcher teams, and ambulances. Part II, "Emergency Field Care," includes a discussion of the injuries and conditions most frequently encountered in wartime disasters; namely, hemorrhage, shock, fractures, burns, suffocation, and carbon monoxide poisoning. There are chapters on principles of bandaging, with detailed illustrations, marking of casualties and disposal of the dead; methods of blanketing a casualty, and methods of lashing a casualty to a stretcher. Special attention is given to crush and blast injuries. Crushing wounds may result from falling masonry, girders, beams, or whole floors dislodged by bomb explosions. Although these injuries may be immediately fatal, casualties often show little

CAMP ANATOMICAL SUPPORTS for NEPHROPTOSIS

TOGETHER with treatment for any existing infection of the urinary tract, Camp Supports have proven valuable adjuncts in the relief of symptoms in many cases.

Camp-trained fitters have been instructed to consult the physician as to the position required for the fitting, if reclining or partial Trendelenburg. In the event that the physician desires the use of a pad, the fitter has been instructed to obtain information as to the type of pad to be used and to ask the doctor to mark on the garment or blue pencil upon the patient the exact location of the pad.

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Advantages of Camp Supports in Conditions of Nephroptosis:

1. The "lifting" power of Camp Supports is from below upward and backward.

2. Camp Supports are an aid in improving the faulty posture that sometimes accompanies renal mobility.

3. Camp Supports are easily and quickly adjusted.

4. Camp Supports stay down on the body by reason of the foundation laid about the pelvis.

5. Camp Supports are comfortable.

6. Camp Supports are economically priced.

Camp fitters ask patients to return to their physicians for approval of the fitting.

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sign of injury when released. Their condition may appear good for a few hours and yet they may die of kidney failure several days later. Directions for first aid are included, and workers are warned that any person "who has been trapped by debris which has pressed on any part of the body must be regarded as a serious casualty." The importance of administering by mouth abundant quantities of fluids and alkalies (sodium bicarbonate) is stressed. Persons exposed to blast from high explosives may also suffer serious internal injury without external evidence of it. The manual urges all persons concerned with the handling of casualties to "suspect blast injuries in every person found near the site of a bomb explosion, especially those who have obviously suffered injury and yet show no external evidence of it." More extensive discussions of these two types of injury are included in the recent OCD publication, "Clinical Recognition and Treatment of Shock." Part III, "Transportation of the Injured," describes regular and improvised stretchers and gives directions for stretcher bearing, with a separate section on types of injury that require special care in moving. Another chapter explains methods of carrying the injured without stretchers, and the final chapter explains the ambulance service of the civilian defense organization and presents specific instructions for loading and unloading ambulances. The latter instructions describe procedures required if war gases are encountered. The manual is intended primarily for the training of rescue workers, medical auxiliaries, ambulance drivers and attendants, and stretcher bearers of the Emergency Medical Service. In the appendix are a schedule of training based on the manual, the OCD Operations Letters describing the work of stretcher teams, the Rescue Service and instructions on self-aid in case of exposure to war gas, and a section on electrical hazards.

URINE-SUGAR TESTING NOW MADE EASY

WITH

CLINITEST

(COPPER REDUCTION TABLET REAGENT)

NO FLAME NO HEATING

NO COMPLICATED APPARATUS

NO WATER BATH

JUST DO THIS:

Add 1 Clinitest Tablet to proper amount of diluted urine in test tube provided. . . . Allow for reaction. . . . Compare with color scale.

Simple . . . ISN'T IT?

No powder to spill—no measuring. . . . Test takes a matter of seconds!

Available through your prescription pharmacy or medical supply house.

Write for full descriptive literature. Dept. I.M.1

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COMMENT and OPINION

Those Figures on Absenteeism

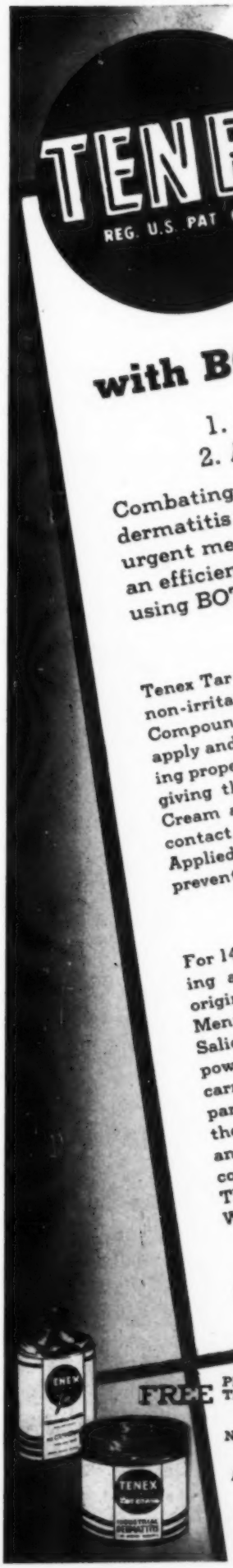
TAKE your choice of the following figures on absences due to illness and accidents as widely circulated in public prints. As factors in over-all absenteeism totals, these published percentages can be so interpreted as to become truly amazing and hopelessly confusing. (1) Reported by the United Press, Washington, March 10: "Secretary of Labor Perkins said before a Congressional committee today that illness and accidents were responsible for perhaps 90% of war plant Absenteeism." (2) A survey completed by the West Coast Aircraft War Production Council, covering Absenteeism in factories of council members, (Consolidated, Douglas, Lockheed, North American, Northrup, Ryan, Vega and Vultee companies), found personal illness to be the greatest over-all cause of absences, accounting for almost 75% of total time losses. (Reported in April 3 *Business Week.*) (3) In an article, "Absenteeism; the New National Malady," March *Fortune* says, "Sickness, whether personal or in the family, accounts for probably half (50%) of all absences." (4) A paragraph in *Victory*, official Weekly Bulletin of the Office of War Information, March 31 issue, states, "According to the Surgeon General's Office, absenteeism due to sickness is 10 times as great as absenteeism due to injury." Note how such variously stated percentages can be resolved into erroneous and positively astounding conclusions on Absenteeism. As an example, let us interpolate here the previously quoted statement of the United States Army War Safety Supervision, to wit: "During the past two years 2,000,000,000 (two billion) industrial man hours were lost through accidents annually; enough to build 66 battleships, or more than twice the number possessed by the combined British and American navies." Now, according to the Surgeon General's Office, "Absenteeism due to sickness is 10 times as great as absenteeism due to injury." So, applying this multiple 10 to the stated 2,000,000,000 (two billion) man hours lost annually through accidents alone, you get 20 billion (20,000,000,000) man hours as the number lost annually because of sickness alone—enough to build 660 battleships, or

20 times the number possessed by the combined British and American navies. Think of that! Adding together the man hours thus assumed to be lost per year through illness and accidents combined, you get 22 billion (22,000,000,000) lost man hours; enough to build 726 battleships, or more than 22 combined British and American navies. All in one year, too! Finally, by subtracting this total of 22 billion man hours assumed to be lost annually through combined sickness and accidents from the grand total (whatever it may be) of yearly man hours lost because of absences for all reasons combined, you would arrive at the yearly man hours lost because of voluntary or true Absenteeism alone. And that probably wouldn't build so many battleships! You can arrive at this more-or-less obvious conclusion by simple deduction and a few minutes with pencil and paper. See how the figures shape up: According to War Production Board information, 42 million of the 53 million total U. S. labor force are engaged in industrial and other non-farm employment. If each of these 42 million workers were absent a single eight-hour day, the hours absent would total 336 million. Now to discover how many days every one of the 42 million workers would have to be absent per year in order to roll up the 22 billion man hours figured above (from published statements) to be lost yearly through sickness and accidents alone, simply divide 336 million into 22 billion. The answer is 66½. Now even little Audrey knows that none of her industrially employed relatives is absent from work 66½ days—more than two solid months a year—for all known reasons combined! "Ridiculous!" you say? Yet before and since Pearl Harbor, authentic-sounding statements about absenteeism—statements not based upon standardized computation procedures, and probably as deceptive as those from which the above totals were resolved—have been widely circulated and widely believed.

—From "What Management Can Really Do to Reduce Absenteeism," Report No. 114, a study by the George S. May Business Foundation.

Noise Abatement

MUCH has been written about a noise abatement program. Some of our cities have gone so far as to enact ordinances seeking to control the clamor that seems to be a part of our urban life. Not much of a constructive nature has been written about the matter, however, hence it is refreshing to find a factual article on the subject. In *J.A.M.A.*, October 23, DRS. MCCORD and GODELL discussed the subject. Their article was written as a part of the report of the Association's Committee to Study Air Conditioning. It is, of course, well known that certain factory dins produce varying degrees of deafness, and that these noises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Cheats
DERMATITIS
Twice
with BOTH Cream and Liquid
1. A Cream to Protect and Heal
2. A Liquid to Treat and Combat
Combating and relieving the many cases of industrial dermatitis which slow production, is one of today's most urgent medical problems. Plant physicians are finding an efficient answer in the TWO-WAY TENEX method, using BOTH a Cream and a Liquid.
TENEX TAR CREAM
Tenex Tar Cream contains a refined extract of coal tar which is non-irritating, and serves as a therapeutic and protective agent. Compounded into a greaseless vanishing cream base, it is easy to apply and needs no bandage. The anesthetic, cooling and soothing properties of Benzocaine and Menthol tend to allay itching, giving the irritated area an opportunity to heal. Tenex Tar Cream also forms a fine protective film over areas likely to contact industrial irritants, without hindering efficiency. Applied before going on the job, Tenex Tar Cream can aid in preventing skin irritations of external origin.
TENEX LIQUID
For 14 years Tenex Liquid has proved its efficiency in treating and controlling fungus skin infections of external origin. A scientific formula containing Chlorthymol, Menthol, Thymol, Phenol, Benzocaine, Oil Wintergreen, Salicylic Acid and Benzoic Acid, the solvent is sufficiently powerful to penetrate to the deeper layers of the skin, carrying a fungicide capable of destroying the causative parasite. Other ingredients exfoliate tissues containing the fungus spores, allay itching and intense burning and help prevent irritation and infection. For greatest controlling efficiency, use TENEX LIQUID, followed by TENEX TAR CREAM. Put TENEX to work for you! Write for your Free Professional Samples today.
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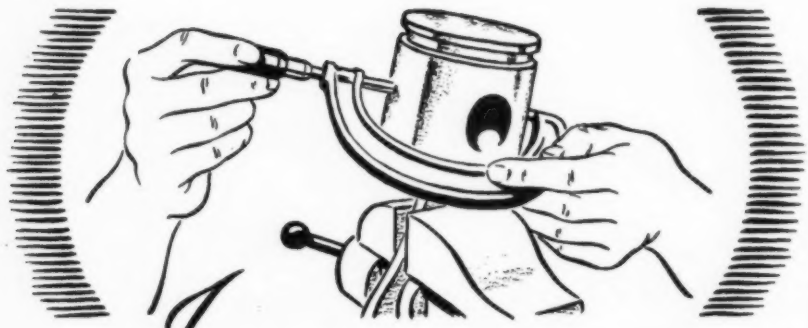

In OCCUPATIONAL DERMATITIS

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seriously interfere with factory production at times. These physicians also declare that the assumption that factory workers become inured to these noises is false. Their recommendations for elimination of many of these noises include structural changes designed to prevent the noises from being transmitted to other rooms in the plant, and sound proofing. Of course, they do not overlook the modern auto horn, that instrument of the Devil himself. With the present system of shift work, when men and women leave for their places of employment at all hours of the night, their share-the-ride partners sounding their horns to announce their arrival materially adds to the din of our cities, and to the great distress of their neighbors. The writers strongly urge that a noise abatement program be made a definite part of the war effort, a suggestion with which most of us will heartily agree.

—Editorial Note in *J. Indiana State M.A.*, December, 1943.

Health Test for Workers

SECRETARY of Labor Frances Perkins tells the national conference on labor legislation that pre-employment medical examination is "a matter of personal liberty" and never should be made compulsory. She adds that compulsory examinations before employment "could lead to universal fingerprinting, to telling us . . . where to live and work." If there is any "personal liberty" issue at stake in compulsory pre-employment examinations, it is insignificant in comparison with the rights and protection of the whole group of workers. Is it "personal liberty" for a man to bring syphilis or tuberculosis or any other communicable disease into a plant and to expose fellow employees? The Wisconsin industrial commission has stated the case clearly: "With mass employment as it exists today, where the safety of many employees is frequently entrusted into the hands of one or two employees—with new processes being developed daily requiring contact with dusts, fumes and gases, many of which constitute a serious health hazard, workers are entitled to the knowledge that their safety is not jeopardized by physical ill health or impairment of fellow employees; they are also entitled to the assurance that diseases communicable in themselves, or in combination with industrial dusts and poisons, are not permitted to gain access or progress in places of employment." Where there is no pre-employment examination, either compulsory or voluntary, paid for by the employer, the probability is slight that the applicant will seek an examination on his own account. If a free pre-employment examination is offered, but not required, a job seeker will take it only if he is pretty sure nothing will be revealed that might prevent or limit his employment. In either case, his fellow workers will be deprived of the protection to which they are entitled. The examination program must, if it is really to protect those already employed in a plant, be compulsory, much as we may dislike the sound of that word. For the applicant himself, the examination offers benefits. He is warned of any physical condition that should have medical attention. His life may be prolonged by adjusting his employment to his physical capacity. He is given a sense of additional security against loss of time or loss of job through ill health. True, employers have actively promoted the program because of new liabilities that were imposed on them by law or a broadened sense of employer responsibility. If the employer was to be financially (or morally) responsible for health and accident conditions in his plant, if he was to contribute to health service or insurance for his employees, he felt he had a right to know that the new employee was a "good risk" and would not endanger fellow employees. The employer was also well aware that efficiency would be higher and absenteeism and turnover would be less in a plant where the health conditions were good. Because the program has been generally sponsored and paid for by employers, although with the encouragement of the medical profession, Secretary Perkins would have been entirely sound if she had merely stressed certain necessary precautions to safeguard the job applicant. Wisconsin statutes already provide some of these. One provision is that no employer shall apply or promote any "oppressive plan of physical examination." Another is that an insurance company dealing in work-

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men's compensation may not influence any employer unreasonably to refuse employment (because of physical condition). Still a third provides that if a job applicant is dissatisfied with the findings or recommendation of the physician who examines him, the industrial commission may require examination by another physician. With these sound precautions, Wisconsin industry and much of Wisconsin labor have apparently found pre-employment examinations of mutual benefit and fairly administered. A few union locals have registered isolated complaints which have led to revision of methods followed by some employers. What works in Wisconsin can be made to work elsewhere, to the benefit of the employer and the workingman whose health is his most valuable asset. Secretary Perkins' fears seem unjustified.

—Editorial in *Milwaukee Journal*, December 14, 1943.

Softies and Supermen

IN AN AGE when the highest stamina is demanded from our potential and actual fighting and working forces the same government that makes the demand is committed to a paternalism that seeks frankly to release its people from strain, worry, fatigue and deprivation, which kind of paternalism, of course, never bred a virile race that could "take it." What, after all, are one's glands for? According to Dr. Madge C. L. McGuinness, Director of the Department of Physical Therapy at Lenox Hill and Misericordia Hospitals, New York City, only 52% of our citizenry are capable of hard work. The other 48% are handicapped by "lack of exercise, machines, malnutrition, fatigue, strain, accidents, self-drugging, drink and tobacco." We see in such handicaps the explanation of much absenteeism. A Beveridge plan, American style, can be depended upon to complete the exhibit.

—Editorial Note in *Medical Times*, December, 1943.

Time for Serious Effort

THE legislative committee of the Illinois State Medical Society—ROBERT H. HAYES, M.D., JAMES H. HUTTON, M.D., and HERMAN H. COLE, M.D. (JOHN W. NEAL, Executive Secretary)—is writing physicians and component medical societies as follows: "You have probably been wondering about the status of the Wagner-Murray-Dingell Bill, S.R. 1161, which proposes the socialization of American Medicine. The purpose of this bulletin is to give you current information on the matter, and to urge you to take action, if you have not already done so. Identical bills are pending in the U. S. Senate and in the House of Representatives, and both bills have been referred to committees. It is generally supposed that the Senate will be the first to give consideration to this proposed legislation. To date, neither the Senate Finance Committee nor the House Ways and Means Committee has taken any action. About a month ago, Senator Walter George (Georgia) Chairman of the Senate Finance Committee, stated that hearings had not yet been scheduled, and that in his opinion it would be some time before his committee would have the opportunity to hold hearings on the Wagner-Murray Bill. The best information now available is that Congress will be kept busy until early 1944 with legislation directly connected with the war effort, and which will consume considerable time; measures relative to taxes, subsidies and the voting of service men in next November's elections currently hold the spotlight. The fact that these bills will probably not be taken up for a month or two can be of great benefit to the opponents of 'Cradle-to-Grave' further extension of bureaucratic control and the socialization of medicine; but only if that time is advantageously used. The trend of public opinion is unquestionably away from the rigid control of business, labor, agriculture and the learned professions by administrative agencies. It is becoming increasingly evident that the people —while realizing that emergencies of war must, in the national interest, be administered by the executive branch of government—will demand that after Victory, the executive branch relinquish its emergency powers, and that the normal balance among the legislative, executive and judicial branches be re-

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stored. Time wisely utilized will give the physicians and the businessman increased opportunity adequately to inform the public at large of the dangers and evils of these bills. Last, but of the utmost importance, if you act now, there is still time for you and your local medical society to contact your Congressman. Many of you have already done so. But to you who have not, and to those component societies which have not taken action, please heed this earnest appeal. To you doctors: write letters to your Senators, to your Congressman-at-Large, and to your local Congressman, protesting the socialization of medicine proposed by S.R. 1161 and H.R. 2861. Also see to it that your medical society, at its next meeting, adopts a resolution disapproving these bills, and see that your Congressmen are notified of the action taken. Don't 'Let George do it.' George has the same surplus of work and the same problems that you have. We know you neither like nor have time for politics. But in this case, the only way you can stay out of politics is to bring about the defeat of these bills!"

Dural Poisoning

IF YOU WORK in an airplane plant or some other industry in which aluminum alloys were used, you may have heard about the condition popularly called "dural poisoning." This takes three forms: (1) the worker gets a splinter of the metal in his skin after which inflammation sets in and an abscess may form; (2) a driller gets a puncture wound which closes easily, but leaves an aftermath of painful, tender inflammation and swelling under the surface; (3) a relatively few workers, about four to six per 1,000, get eczema, itching or other skin disease from contact with the light metal dust. A test pilot who took up a new airplane, it is reported, had a sliver of light metal penetrate his lip causing a severe inflammation. The magnesium in the alloy is specifically responsible for the characteristic disturbances, DR. LUDWIG TELEKY, of the Industrial Hygiene Division, New York State Department of Labor, declares. When the magnesium gets into the body tissues it decomposes the water, as potassium and sodium do. As a result, cavities form in the tissues and bubbles of hydrogen gas develop in the cavities. The magnesium hydroxide which is produced as part of this chemical reaction is apparently absorbed by the tissues. Splinters of light metal alloys, DR. TELEKY also points out, have many small barbed hooks which can be seen under the microscope. These stick in the wound, and attach themselves to the skin and clothing. Splinters of iron, steel, copper and other heavy metals and of pure aluminum are much smoother and these metals almost never cause inflammatory reactions.

—*Hackensack, N. J., Bergen Eve. Rec.*, December 15, 1943.

Books Needed

VAST public health and rehabilitation problems facing Soviet authorities in the thousands of devastated communities recaptured from the Nazis this year are reflected in an appeal just received by Russian War Relief for more than 200 American textbooks urgently needed in Soviet medical schools and libraries. Dr. Vladimir V. Lebedenko, noted Soviet neurosurgeon now in the United States on a Red Cross mission, gave the list to Russian War Relief with the plea that the books be collected as quickly as possible to aid in the training of thousands of additional physicians and other personnel needed to handle the enormous post-war job of rehabilitating soldiers and civilians suffering from the terrible impact of this war. Russian War Relief pointed out that whereas medical textbooks previously requested by Soviet authorities were devoted to problems of military medicine, this new list is much broader in subject matter, ranging from plastic surgery to nutrition. It reflects a growing interest of Soviet health officials in the latest American findings in such fields as the treatment of tuberculosis and pneumonia, dietetics, child psychiatry and play therapy, stomach diseases, war neuroses, occupational therapy, psychology and mental hygiene. A few works on cattle and insect diseases are also needed.

Supplies Needed

DR. JOSEPH PETER HOGUET, Medical Director, Medical and Surgical Relief Committee of America, New York, addresses physicians and sur-

NEW LIGHT ON AN AGE-OLD PROBLEM

New manifold-acting preparation contributes to effective vaginal therapy—aids in the control of infection and tends to stimulate healing of certain vaginal lesions.

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Allantomide Vaginal Cream is available in 4 oz. tubes, with or without an applicator. The cream is odorless and stainless. Two drams administered twice daily are usually sufficient for effective anointment without producing leakage. Additional information will be gladly supplied. Write The National Drug Company, Dept. G, Philadelphia 44, Pennsylvania.

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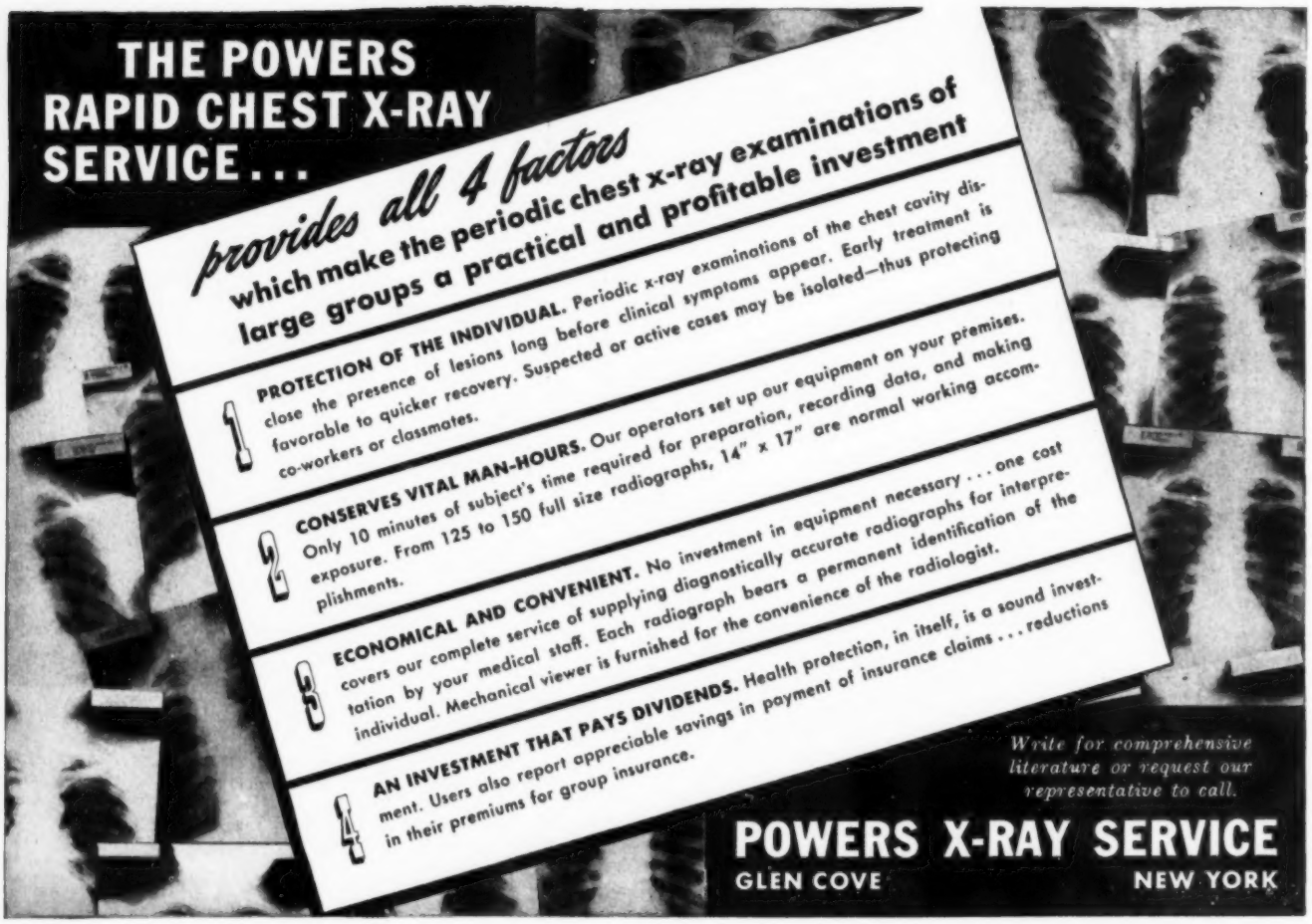
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geons: "There is a critical need for medical and surgical supplies that may lie hidden and forgotten in your office: discarded or tarnished instruments . . . surplus drugs . . vitamins . . . infant foods. Collected, packaged, sent to the Medical and Surgical Relief Committee, they can play a vital role in its program of medical relief for the armed and civilian forces of the United Nations. Surgical instruments and medicine are sought after by physicians and pharmacist's mates of our Navy . . . are hungrily snatched by the medical corps of our Allies. The work of war zone hospitals and welfare agencies is too often crippled by the lack of medical supplies. Community nurseries in this country, refugee camps abroad cry out for vitamins and baby foods for their ill-nourished charges. You may have read about the Committee. It has supplied over 900 sub-hunting and patrolling ships of the Navy with emergency medical kits; equipped battledressing stations on battleships, destroyers, and cruisers. The Committee's roll-call of medical requests—not one of which has been turned away—reads like a world geography: the Fighting French in North Africa and Tahiti; the Royal Norwegians in Canada and Iceland; the West Indies; South and Central Africa; China; India; Great Britain; Yugoslavia; Greece; Syria; Russia; Alaska and of course, the United States. To meet the demands that pour into headquarters, the Committee needs all types of instruments, especially clamps, scalpels, forceps, and all kinds of drugs from iodine to sulfa products. By contributing what you can spare, you will help speed another shipment of sorely-needed medical aid."

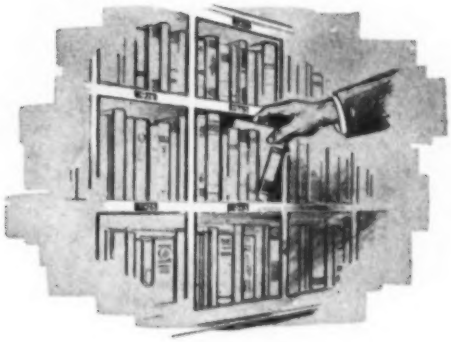
Soviet Health Care

EACH large enterprise in the Soviet Union (with 250 or more workers) has a health center on its premises at which workers and their families receive medical service. To care for both the day and night shifts, this health center functions as a rule on a round-the-clock basis. The health centers, often termed polyclinics, are engaged not only in treatment but also in sickness and accident prevention through inspection and education. In *Trud*, the central trade union paper, the director of medical services at the Tashkent Textile Combinat in the Uzbek Republic wrote a story, just 10 days before the Nazi attack, on "How We Lowered Sickness Incidence and Traumatism"; he emphasized the importance of the doctor visiting the shops and giving brief lectures on health matters, going to the scene of an accident together with trade union representatives and sanitary inspectors, and making his presence felt in other ways outside the walls of his office. Through efforts such as these the Tashkent Textile Combinat had lowered sickness incidence in the previous two years by 40%. This combinat offered a wide variety of medical services through its polyclinic, its hospital, its nursery, and its mother and child section. Not all Soviet enterprises have as complete a set of facilities, although some, like the Kaganovich Ball Bearing Plant with its million-ruble health budget and more than 100 physicians, exceed it. Those enterprises which are in the vicinity of large hospitals usually limit their services to routine and emergency work, and then the hospital clinics become the centers for complete service to the workers of these plants. Enterprises with fewer than 250 workers will often make joint use of a polyclinic in their immediate neighborhood. Some 7,600 factory health stations had been established by 1940.

—From "Soviet Health Care in Peace and War," by ROSE MAURER, American Russian Institute.

Red Cap

FOR nearly a year, the Louisville Ordnance Division has employed a number of totally deaf individuals, many of whom are also mute. It was soon apparent that most of these employees could be developed into efficient workers within a short time and that their disability reduced the effect of some forms of distraction to which other workers are often affected. It soon became apparent, too, that the handicap of deafness might possess some safety implications. At Louisville



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Ordnance Division, for example, workers are required to clear from under crane loads, being warned of approaching loads by the crane bell and in some instances by hookmen. At the suggestion of one of the foremen, a distinctive marking in the form of a bright red cap was adopted for use, but only after ascertaining that the deaf employees had no feeling that such a procedure would mark them as being apart from the other workers. The caps chosen were of the type used by members of soft ball teams, and to date we have not had a single instance where a worker with normal hearing has worn a cap which could be confused with those worn for this protective purpose. Cranemen and operators of industrial trucks have the added responsibility of compensating for the inability of these men to hear warning signals. The cooperation of these men and of their fellow associates has made this procedure a success in keeping these workers as free of hazards as any other group of workers on similar work.

—R. N. Trowbridge, Safety Supervisor, in *Westinghouse Safety News*, January, 1944.

Can't Ration Sickness

The wholesale druggists of the country are "doing an effective job in serving the health needs of the people, notwithstanding the fact that government bureaus have thus far failed to meet promptly and fully the emergency situation that has arisen. The government particularly has failed to consider the importance of distributing essential drug merchandise, and also has failed to provide for essential drugs and medicines on an emergency need basis as against a rationed basis. So far it has been impossible to ration sickness. That being the case, it is not sound policy to ration either the preparations or the services required to help the sick."

—National Wholesale Druggists' Association.

Union Response

A resolution was adopted by the American Federation of Labor at its meeting in Boston recently calling to the attention of affiliated unions the fact that local public health departments are prepared to give blood and other tests without charge to the individual and that members of organized labor are encouraged to make proper use of these health protection and promoting facilities. In California a resolution was passed requiring blood tests as a requisite for becoming a member of the American Federation of Labor.

—*J.A.M.A.*, December 25, 1943.

X-Ray Psychology

It is astonishing to observe what profound psychological value the x-ray apparatus has. Even today, the average physician has no conception of the great extent to which fear dominates the lives of his fellow men. We know that they have bruises, or muscular rheumatism or a neurosis; they are sure that they have broken bones, tuberculosis or cancer. We carry out an x-ray examination for all industrial workers who desire it (Morris Motors, Ltd.) and show the patient the x-ray film on the viewing screen. The heartfelt response, "How you have relieved my mind," probably makes this form of service of greater real value than the use in finding broken bones.

—I. G. Briggs, M.R.C.S., in *Brit. J. Phys. Med.*, June, 1943, quoted in *Clinical Medicine*, December, 1943.

Diet and Toxic Agents

The concept of the adequate diet stresses dietary needs of the body under normal conditions. Clinically it is recognized that an adequate diet under normal conditions may be inadequate in several respects when disease is present. What has not been recognized generally is the fact that many individuals are exposed to environmental conditions especially of work which can hardly be considered normal. This applies particularly to industrial workers who are exposed to toxic agents. Experimentally it has been shown that certain of these agents lose their toxic effects, wholly or in part, when the diet is modified. While the goal of the industrial hygienist must be to provide an environment which is as free from toxic agents as possible, the possibility of utilizing a second line of defense, that is, a diet modified so as to protect the individual against the specific toxic agents, has not been adequately studied. The effective protection against toxic agents by

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Azochloramid preparations have proved valuable in treating the traumatic wounds of industry as well as those encountered among our armed forces. The reduced healing time and shortened period of hospitalization effected by prompt control of infection is a welcome contribution to greater industrial efficiency. The various forms of Azochloramid provide ready adaptability to the task at hand.

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Antiseptics and Their Action, R. M. Freeman: *Industrial Medicine*, February, 1940.

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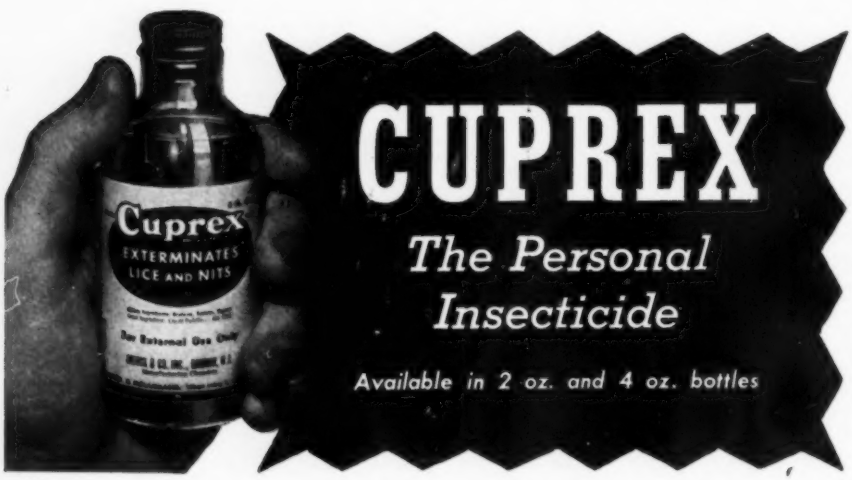

dietary constituents has been demonstrated for a wide variety of compounds. Most investigations have been designed to show that more protection is afforded by an adequate than by a deficient diet. What has not been studied in many instances is the effect of additional quantities of specific dietary constituents or variations in relative amounts of foodstuffs on the toxicity of certain noxious substances. The effects of vitamins of the B-complex, ascrobic acid, and variations in dietary protein, carbohydrate, and fat on the toxicity of certain agents to the liver have been previously reviewed in this journal (*Nutrition Reviews, 1:88, 168, 247, 274, (1943)*). Symptoms referable to trinitrotoluene poisoning in man have been reported in 25 per cent of the munition workers in England, and certain of the clinical and industrial aspects of such poisoning among English and American munition workers described (*Proc. Roy. Soc. Med., 35: 553 (1942)*; *New Orleans Med. & Surg. J., 95: 511 (1943)*). Of the lesions due to trinitrotoluene in man, dermatitis, cyanosis, and gastritis are common but not fatal; toxic jaundice and severe anemia are infrequent, but often fatal. The experimental production of severe liver damage and anemia by trinitrotoluene has not been previously reported. In the paper by Himsworth and Glynn, it is reported that the feeding of trinitrotoluene along with a high fat diet leads to effects in rats which clinically and pathologically closely resemble those reported in human cases of trinitrotoluene intoxication. The development of the toxic symptoms in the rat is greatly dependent upon the nature of the diet. Thus, severe symptoms and pathologic lesions develop in rats taking a high fat diet as compared to the mild toxic symptoms in rats on a high carbohydrate diet, and the complete absence of symptoms in those consuming a high protein diet. Among the effects of chronic trinitrotoluene poisoning in rats on a high fat diet are (1) loss of weight; (2) increased appetite; (3) excretion of high concentration of trinitrotoluene derivatives in the urine; (4) characteristic changes in the blood including a great decrease in hemoglobin, the appearance of normoblasts, reticulocytes, and polychromatic erythrocytes in the peripheral blood, an erythroblastic hyperplasia of the bone marrow and siderosis of the spleen; (5) hepatic lesions which range from fatty infiltration to an acute necrosis of the parenchymal cells; and (6) loss of hair. The effects of the fat diet in facilitating the toxic action of trinitrotoluene do not seem referable to an increased absorption, but rather to some influence on tissue metabolism. The influence of the fat diet itself on the production of this pathologic picture was ruled out by control groups receiving no trinitrotoluene. While it is not possible to relate these results on rats directly to man it is of interest that studies of trinitrotoluene poisoning in munition workers during the last war led to the suggestion that the absence of cases of severe poisoning in certain instances appeared to be due to the good quality of the diet provided. From the reports available it would appear that there is a higher incidence of trinittrotoluene toxicity in the English munitions factories than in this country. A major reason for this difference may be that the industrial hygienic conditions in the United States are more highly developed. However, the possibility also exists that in addition the diet of the English workers has been less adequate.

Treatment of trinitrotoluene poisoning has included a high-carbohydrate, low-fat diet with additional vitamin B-complex and vitamin C and additional protein, but the same dietary regime has not been applied as a preventive measure. The English clinical investigators have recognized the possible role of high protein intake in liver protection, and the possibility of giving skim milk to the workers has actually been suggested. On the other hand, a recent review by Eddy in this country (*New Orleans Med. & Surg.*

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Dupuytren — the great French surgeon — early recognized that pain is not only a symptom, but a pathogenic, destructive factor as well. This is especially true in hemorrhoidal conditions in which there is both pain and hemorrhage, and in which the venous engorgement is aggravated by the inflammatory reaction of the intensely irritated nerve endings.

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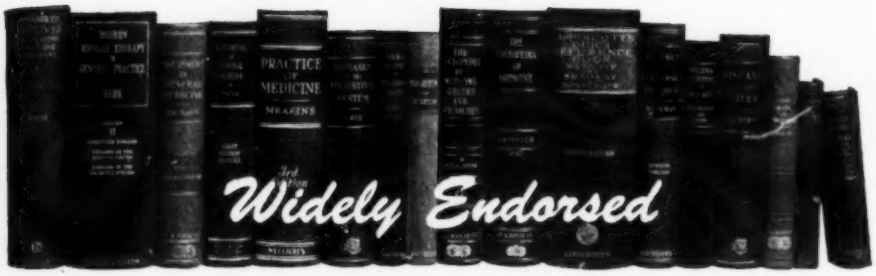

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PACE-MAKER OF BILE ACID THERAPY

J., 95: *511* (*1943*)) states that there is no scientific reason for giving milk or multiple vitamin products to workers in trinitrotoluene factories for purposes other than "improvement in nutrition." This statement, at least as regards milk, can hardly be accepted as tenable in view of the work of Himsworth and Glynn. A comparison of the dietary histories of trinitrotoluene workers showing symptoms of toxicity and of those who do not, might yield valuable information on this point and might also serve as a suitable starting point for the investigation of the effect of diet on trinitrotoluene toxicity in man.

—*Nutrition Reviews*, December, 1943.

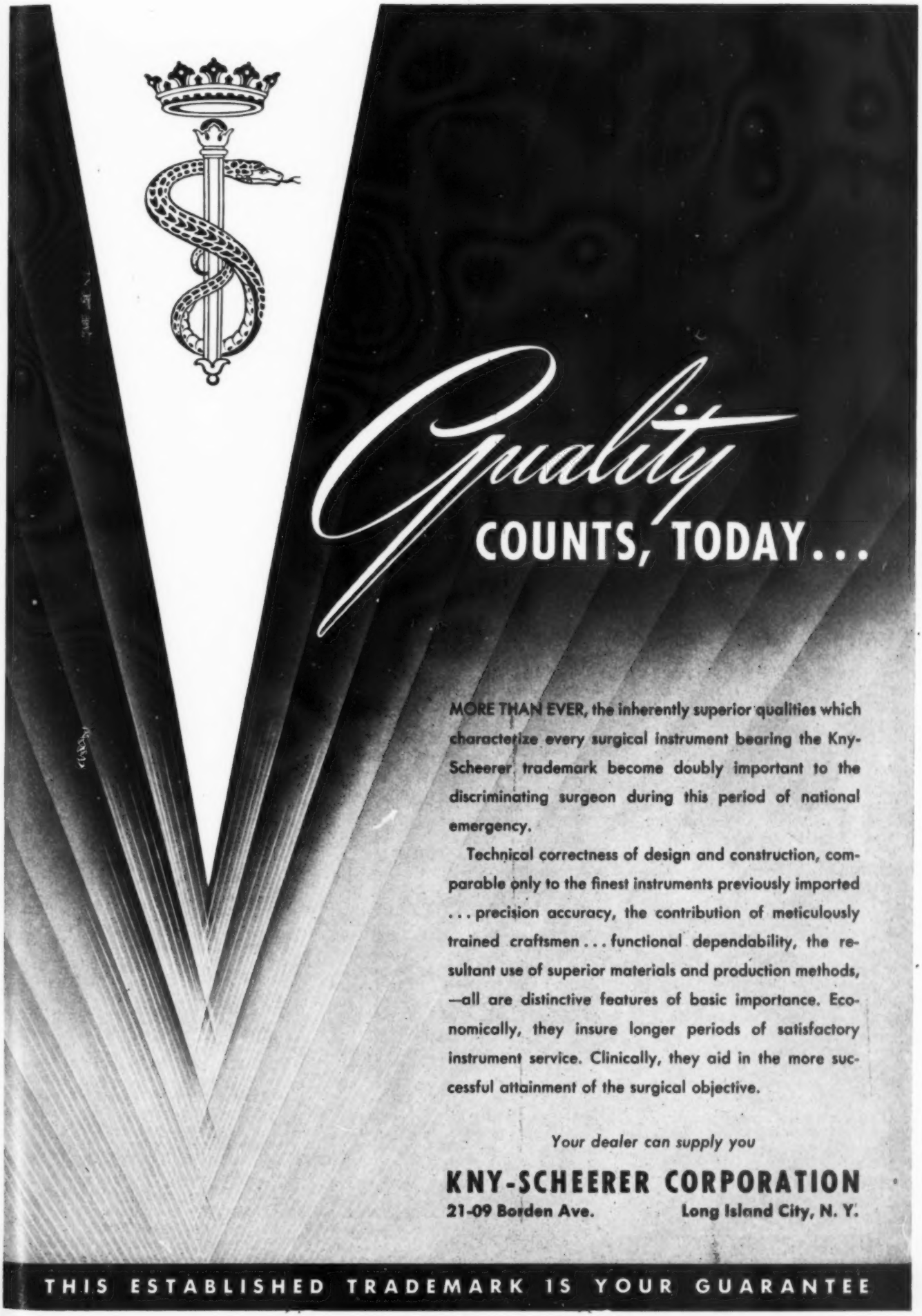
Company Cooperation

THE DUST was then so thick in the furnace room that you could not see men or objects 15 feet away. There were seven furnaces. Of course, you could see the white glare from the furnace door and the molten carbide when it was first poured. The process is to dump molten carbide into 'chill cars' until it is sufficiently chilled to be an adhesive mass. Then it is dumped, still red hot, and stacked in the same building. The heat is terrific." "Many more workers were 'burned out' than is common even in our trade"—the term referring to complete prostration, often accompanied with nausea and severe cramps. The hazard due to fainting and prostration in a building where red hot carbide is stacked is serious. Before the improvements were installed by the company, the place was comparable to open-hearth furnaces and foundries, long considered among the most hazardous occupations. "Dust and heat were the great difficulty in the furnace room, the crushing room and the packing room, but the menace of explosion and burning from explosion in the wings devoted to production of acetylene and nitrogen also was serious. Several employees have been burned in explosions, and at least one man killed. While undoubtedly there was some slip made in planning the plant, the company met the union more than half way in trying to correct conditions. In addition to the improved ventilation in the plant, it installed brick shower rooms for both white and colored employees. This minimizes the danger of pneumonia in leaving a heated place. I have said that the company has cooperated to remedy the bad working conditions due to plant layout. However, in negotiations they said something that surprised me. It seems that that Louisville plant is an exact duplicate of one in West Virginia where the company officers told us they were having 'no trouble.' They said West Virginians did not seem to mind working in heat and dust. I rate disregard of such excessive dust, heat and lack of ventilation as at least short-sighted, even if no vigorous protest is made."

—WILLIAM FREDENBERGER and HAROLD COLVIN, National Representatives, Firemen & Oilers' Union, in *Louisville Times*, December 24, 1943.

Rehabilitation of Workers

HAVING in mind the importance of maximum efficiency on the part of everyone, Spies has recently given an account of the benefits produced by restoration of good nutritional status in persons who have been cast aside from the active stream of life as the result of nutritional deficiency (*J.A.M.A.*, *122; 911* (*1943*)). The report gives an interesting account of this well known worker's growth of interest in nutritional deficiencies and describes the development of the Nutrition Clinic in Birmingham, Alabama. He calls attention not only to the improved health of patients who have been treated, but to their improved attitude toward life in general. It is of interest to read how the patients would flock to the Clinic when a member of the community with pellagra psychosis was effectively treated, on the expectation that all persons with mental symptoms would be benefited by the same form of treatment. Likewise, the successful treatment of certain cases of ulceration of the cornea was followed by a series of patients seeking relief for other ocular complaints. A fruitful field proved to be the study of the patient's family, for frequently in areas where nutritional deficiency was endemic the whole family suffered from nutritive failure of more or less degree. As might be expected, visits to the homes of the patients were most useful, not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only in determining what they ate, but in discovering what food resources existed, such as a garden, chickens, and cows. Many of these patients had been classed by unsuspecting physicians under such heads as hysteria, neurasthenia, anxiety states, functional disorders, or even nephritis or scarlet fever when edema or a red tongue were prominent symptoms. Consistently, weakness, failure of mental application, nervousness, and irritability were found in these patients and these symptoms could in most instances be relieved by dietary means. Spies stresses the importance of a well rounded diet and yeast in treatment although, where severe deficiency existed, crystalline vitamin supplements were used to great advantage. One hundred persons, debilitated solely by nutritional deficiency to the point where they could not work, were selected and treated. Not only was the immediate response to treatment gratifying, but persistent therapy enabled them to obtain work and earn sufficient funds to provide an adequate diet. When restored to health, many of these patients were grateful and anxious to cooperate, with the result that benefit persisted not only for the individuals treated, but for their families as well. Such observations are common knowledge to most persons interested in the field of nutrition. It is unfortunate that improper publicity has put nutritional therapy, to some extent, in a bad light. When the medical profession as well as the lay public has learned to recognize what adequate nutrition cannot do, as well as what may be expected from it, the correct "mean" will have been reached.

—*Nutrition Reviews*, December, 1943.

Congress on Industrial Health

THE SIXTH Annual Congress on Industrial Health will take place on February 15 and 16, 1944, at the Palmer House in Chicago. The sessions follow directly after those of the Annual Congress on Medical Education and Licensure. The deans of medical schools and others interested in medical education may find it possible to attend the sessions on industrial health; a special effort will be made to induce them to do so. Official representatives of medical societies and allied organizations can attend both congresses this year without extra travel. One of the great obstacles to the growth of industrial medical service has been the slow development of public interest in the health and economic benefits which the physician can bring to the industrial organization. The Congress therefore, will attempt to attract greater interest from management and labor. Prominent representatives of these groups will be asked to participate. Interest in the physical welfare of the working population must be maintained even after the stimulus of wartime production is over. This element in postwar planning must be encouraged. The sessions will attempt to bring this relationship into proper focus. The congress will also emphasize the importance of physical restoration, retraining and re-employment of the disabled, an issue which is certain to be a source of medical preoccupation for some years to come. Industrial health is gradually assuming greater and greater importance as an avenue for the distribution of medical service. Every physician and medical organization should recognize the trend so that the movement may be guided along dependable scientific and educational lines.

—*J.A.M.A.*, December 25, 1943.

"Bread with Your Drinks"

DR. WILLIAM D. MCNALLY, Cook County coroner's physician, was the chief speaker of the final day of the convention of the State's Attorneys Association of Illinois, December 30, at Chicago. He described the modern tests for poisons usually used in murders. Alcohol, he asserted, also is a poison. He described the quick action of alcohol on an empty stomach, and then the deterrent action of food. "I once attended a party with a friend of mine," he said. "I noticed that with every drink he nibbled a slice of bread. He drank an astonishing number of drinks and was able to navigate under his own power." He then explained that carbohydrates were the best deterrent to alcoholic action. He also said that increased consumption of alcohol was followed by an increase in the number of murders.

—Press Item.

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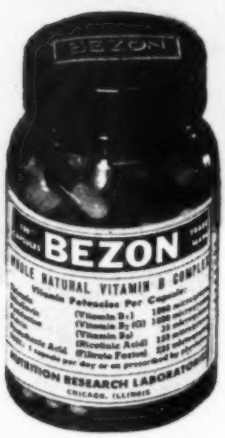

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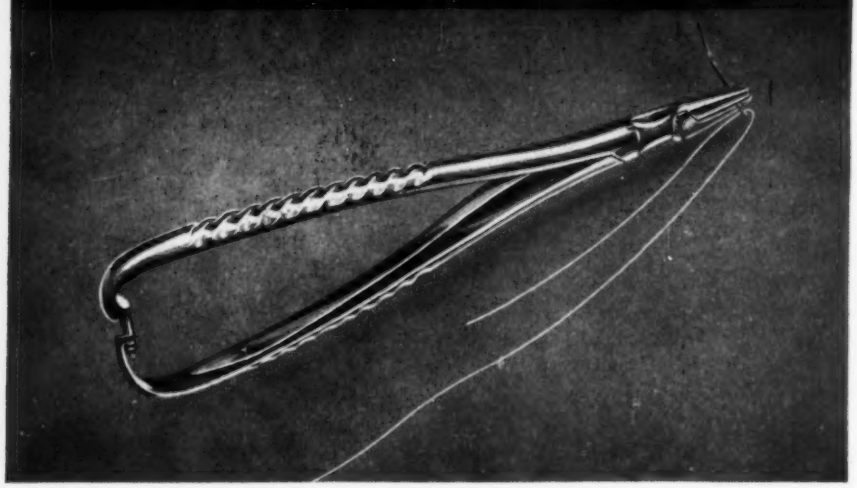

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Rhode Island Society

THE Rhode Island Industrial Physicians and Surgeons and the Rhode Island Industrial Nurses Club had their last 1943 meeting at the Ashton plant of the Owens-Corning Fiberglas in Ashton, Rhode Island, on December 21. At about 9:00 the members began arriving at the gate to the plant. Each guest had to sign a slip and receive a badge of identification. They were met at the personnel office by MR. RHODES, the safety engineer, and DR. JAMES SHERIDAN, the plant physician, and then conducted to the lecture room where they were given a demonstration of the various products manufactured by Owens-Corning. One interesting feature of the trip into the plant was the study of the personnel methods. Many of the physicians tried out the machine used to classify the ability of prospective employees. The prospective employee sits before a switchboard with problems, questions and answers, on it and, by the turn of certain dials, selects the answer which he thinks is proper for the problem at hand. The instructor on the other side can at once gauge his answers and rate him accordingly. MR. HAUMASSER, superintendent of the continuous forming department, with a group of guides, then conducted the doctors and nurses on an extended tour of the plant. They saw the special formula glass beads poured into the hopper filters, coming down as 204 fine strands, gradually spun on to a drum and made into a single thread; and they followed the entire process through until the thread was twisted and wound on reels. They also inspected the Medical Department, and luncheon was served. It was announced at the meeting that the January session will be given over to a round-table discussion of the procedures involving the care of industrial patients by doctors and nurses in industry.

Industrial Nursing

THE Industrial Nursing Committee Chairman, MRS. GRACE BECK, R.N., Blue Ridge Glass Corporation, Kingsport, of District 5, Tennessee State Nurses' Association, reports the following concerning the activities of the industrial nurses in Upper East Tennessee: (1) Encouraging the addition of an industrial nursing unit in the curriculum of the two basic nursing schools in that area. Lectures on occupational diseases have been given by DR. C. F. N. SCHRAM, of the Tennessee Eastman Company. (2) Promotion of a local industrial nurses' organization in November, 1942, to supplement the meetings of the Tennessee State Nurses' Association, District 5. The original idea was to meet every two months to discuss case histories and newer methods of treatment, and for a general exchange of ideas in an effort to learn the newer aspects of industrial nursing as applied to present day practices. The public health nurses participated in the first few meetings. It was found these two groups of nurses were closely associated by having many health problems concerning workers which were common to both. It was learned that each could prove helpful to the other. Thus, information concerning prevalent communicable diseases and ways of combatting them were discussed. Dates of various types of immunization clinics and other health department activities important to industrial workers were announced to the group. The organization named itself the "Kingsport Area Health Workers," and shortly after its inception the industrial dietitians were interested and contributions were made in the form of a talk on "Problems of War Time Feeding and Nutrition." An invitation was extended to all dietitians and others in charge of plant cafeterias to attend the meeting. Other programs included "Day Nursery Care for Children of Working Parents," and refresher lectures on "Anatomy and Physiology" by a local industrial physician and an army physician. We have included now not only industrial and public health nurses but office nurses, dietitians, Office of Civilian Defense workers, social service workers, and directors of various local childrens' service, tuberculosis and hospital organizations.

—*Tennessee Industrial Hygiene News*, Vol. 1, No. 4, Industrial Hygiene Service, Tennessee Department of Public Health.

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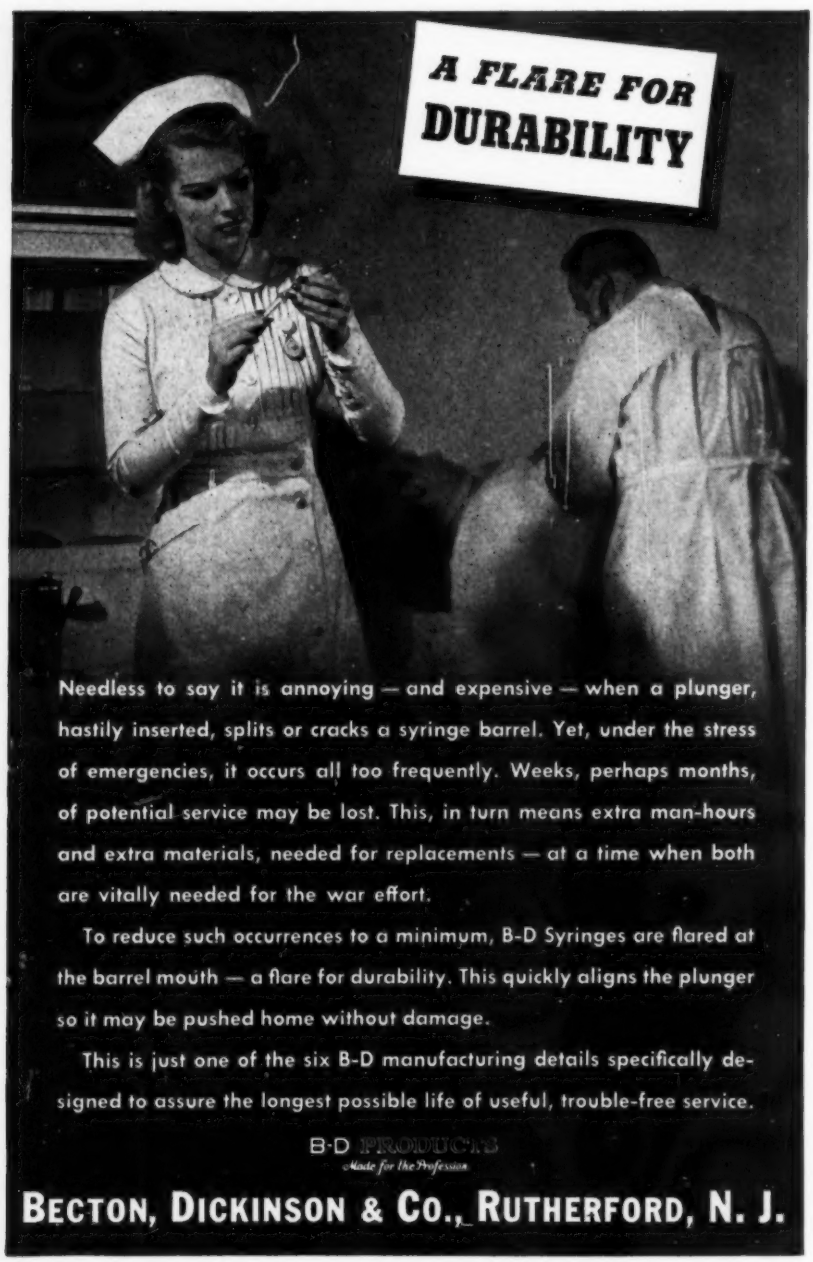
FROM the pen portrait of DR. VOLNEY S. CHENEY, in "Who's Who in Industrial Medicine and Surgery," INDUSTRIAL MEDICINE, January, 1934:

"The doctor in industry is truly a 'specialist.' But, as it applies to him, the term has an individual and special meaning. He does not specialize in any branch, or part, or kind of medical practice. Instead, he specializes in the application of all branches and parts and kinds of medical knowledge to the specific situation wherein the patient is the employee of an employer and wherein the relation between himself and his employee patient is maintained under the shadow of the fact that the employer, directly or indirectly, will pay the bill. The employer is thus a third party in the industrial medical picture. And he, as employer, is there, in final essence, as a matter of business. This brings the doctor in industry within the scope of economics, and justifies DR. CHENEY'S own conclusion, arrived at from his own experience, that 'the claim of the physician in industry to being a specialist is not based upon his possession of any peculiar medical knowledge, but chiefly upon his knowledge of non-medical things. . . . To specialize in industrial medicine requires a knowledge of certain social, economic and administrative problems related to industry that are not in the medical curriculum. . . . The difference between a physician in general practice and an industrial physician consists of the latter's appreciation of the problems of industry and the application of the art and science of medicine and surgery to those problems. . . . He must have a general knowledge of industrial relations, including employment methods, labor turnover, job analysis, apprenticeship, pensions, insurance, rest periods, absenteeism and welfare problems, and a working knowledge of the workmen's compensation law of his own state—and of other states also if his industry is national in scope.'"

FROM "The Industrial Physician," C. O. SAPPLNGTON, M.D., DR. P.H., in INDUSTRIAL MEDICINE, January, 1934:

"A good idea of what an industrial physician is and should be may first be gained by knowing what industrial health work is. Various definitions have been given for this expression; among them the following:[1] 'Industrial health work includes provisions for the protection, conservation and maintenance of mental and physical health for the industrially employed. This includes also the effect of his industrial environment upon the employee and his reaction to it.' In a more specific way, Britton[2] has simply defined the industrial health program in the following terms: The organization of the medical staff and the program of its work include: (1) examination of all new employees; (2) periodic re-examination of all employees; (3) regular inspection of all working conditions; ventilation, lighting, temperature variation, general sanitary conditions and cleanliness—and special supervision of all known conditions where there is a health hazard; (4) consultation and advice for any employee on personal health problems; and (5) active cooperation in community health activities. The cost of a well organized, competent medical department which can regularly and satisfactorily carry on all functions will not be an impossible burden on industry. If industry does less, it is not carrying its full share.

"The qualifications of the industrial physician have been stated by various persons and authorities. MCCORD[3] has believed that the following are the essentials: (1) The industrial physician should have some experience in general practice in order that he may know man and his foibles. (2) He should have a knowledge of medical practice, not necessarily profound; of the fundamentals of industrial relations; of applied preventive medicine; occupational diseases, psychopathic medical investigation; recreation and accident prevention methods. (3) He should have knowledge of the special problems relating to employment of women and children; some knowledge of pensions and insurance, including liability and group; some knowledge of plant organization, which is likely to prove effective in dealing with the problems of labor. (4) He should have knowledge of employment methods; some notion of job analysis, and physical and mental tests, to determine the fitness of applicants; knowledge of race problems, industrial training, apprenticeship, continuation schools for training in particular jobs, and at least some knowl-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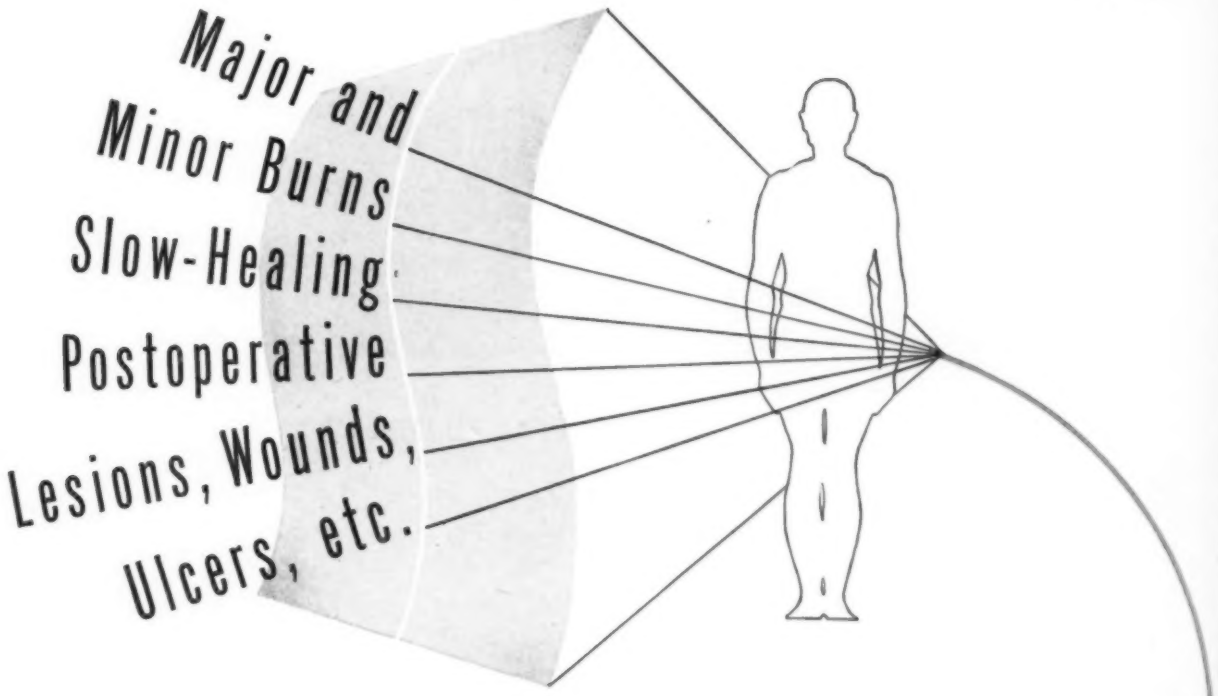

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edge in relation to the cost of living according to local standards. (5) He should have knowledge of the hours of work in relation to fatigue and output; knowledge of shift systems, rest periods, regularity, absenteeism, and labor turnover and its cost. (6) He should have at least a superficial knowledge of the security and continuity of employment in slack seasons, while convalescing from accident or disease, in case of labor-saving improvements, as well as with the advent of old age. (7) He should have a general knowledge of physical working conditions, safeguards, disagreeable gases and dusts, heating, lighting, ventilation, locker rooms, wash rooms, rest rooms, restaurants, hospitals, laundries, toilets, showers, plant beautification, drinking water, etc. (8) He should be qualified to carry out physical examinations of applicants and periodic re-examinations of employees. (9) He should have very definite knowledge of housing, transportation, recreational and educational facilities; the transfer and replacement of misfits, or, as has been said 'fitting the square peg into the round hole.' (10) He should be familiar with the follow-up work, especially among new employees, and with the injured; and familiar with the placement of injured and crippled employees.

"What the industrial physician should know has also been given a great deal of consideration. GRAY,[4] for instance, has said that an industrial physician should be familiar with the classifications, causes, treatment, and methods for prevention of occupational diseases, and advises that the general classification of HAYHURST, printed in the *Monthly Labor Review* of the Bureau of Labor Statistics, U. S. Department of Labor, July, 1929, be used as a guide. This classification includes: (1) specific occupational diseases; (2) diseases partly occupational, namely, hazards elsewhere; (3) occupational health complaints; and (4) non-conformities advanced by occupation. GRAY further states that it is wise to have in mind the principal factors involved in industrial environment, which may be named as follows: (1) those conditions in industry where poisonous materials and hazardous processes are utilized; (2) general ventilation; (3) illumination; (4) sanitary facilities; and (5) conditions conducive to industrial fatigue. Especially interesting is the relationship of the physician to other officers of an industrial organization.

"DR. T. LYLE HAZLETT[5] has described what he believes to be the qualifications of what he calls the physician-administrator: First among these, there must be a sound medical foundation. This not only includes graduation from an A-1 medical college, followed by at least one years' internship in a good general hospital, and if possible some further post-graduate work, but a full collegiate course is also desirable. In a large medical organization it is very desirable to have men who, in addition to the foregoing, have had special training in eye work, orthopedic surgery, nose and throat, x-ray, and physiotherapy. Further, there must be shown an interest in industrial health hazards, such as irritation of lungs by various dusts, in sanitation, fatigue, thermal conditions, and, in manufacturing, the effect of electric current on the human body. If this interest is not evident at first, it must be created through changing the routine of the medical staff by occasional post-graduate courses, special medical meetings, etc. This will not only broaden the mind of a man doing industrial work but also will have a marked tendency in keeping him from becoming mechanical in the treatment of routine cases. And it has been thought desirable for all men to maintain a private office if only for one hour a day, thus keeping an additional contact with the public, aside from increasing income.

"The second requirement would be a pleasing personality. Confidence of employees is perhaps more dependent upon this than any other qualification. First impressions are the most vital. In the examining room for new employees will be painted a picture which may have a great bearing on the employees' attitude toward the company, and it may be beneficial or harmful, depending largely on the examining physician. In the present rate of production there must be a sympathetic attitude somewhere, and in no place will this give greater dividends than in the medical department. Therefore, we should have in the physician a pleasing personality, a sympathetic nature, and the ability to smile under adverse conditions.

"The third qualification is honesty. A physician must be honest in his opinion, regardless of whether it is adverse to the company or to the employees. Nothing will tear down the confidence of employees in their medical department so much as the feeling that the opinions they receive are biased in favor of the company.

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An industrial man must guard against being biased in his opinions, and he must be diplomatic. In controversial cases a well trained physician will realize that he is dealing with a sick man, perhaps entirely mental, but nevertheless a troublesome case and one in which very often the individual will have the opinions of his fellow workers with him.

"The fourth qualification is what can be called an industrial mind. This implies the individual ability to see not only from the standpoint of the company but also from the standpoint of the workers in the ranks, and to view industrial medical work from an economic angle as well as a humanitarian one. From the economic angle the individual with this ability will see the future effects of all preventive work, whereby workers are kept productive for years longer by the early diagnosis of tuberculosis, finding of latent syphilis, changing of occupation among cardiacs, watching lung irritations in sand-blasters, etc.; in short, the material benefit of periodic health examinations. From the humanitarian standpoint there is the prolonging of life and making it more happy for the individual and for all those with whom he comes in contact, and benefiting the community and the nation as well. With this he will acquire an insight into the psychology of the worker possessed by no one else within the organization. He will see the relationship between the man's work and his home conditions, which infrequently has a great deal to do with the occurrence of accidents.

"The fifth necessary qualification for the industrial medical man should be a willingness to enter into all community health affairs. An ever willing listener to all home conditions, his support should be available for all community clinics, and he should be interested in all school medical work, for the future industrial workers are in our schools today. He should be active in all local medical societies, and on friendly terms with all outside physicians. The reputation of the plant's medical department will hinge largely on the ability of the plant physician to cooperate with the family physicians of the employees. The success of all preventive work within a plant will depend in no small degree on the cooperation of all the physicians in the community, and this can be accomplished if the proper tact is used and it is understood by all. There has been trouble at times, owing to the lack of understanding between plant physicians and family physicians, but one can imagine no situation which cannot be handled if there is a thorough understanding before it is undertaken.

"Finally, but not least, we must mention adaptability as a very necessary qualification. The industrial medical man must be broad-minded both medically and otherwise; he must be able to change his opinion if circumstances arise demanding a change either for the good of the company or the employee; and he must receive suggestions at all times gracefully no matter from whence they come. With such qualifications, either evident or potential, any medical man can be assured of hearty backing by the management, and industrial medicine will soon reach the place it deserves in our ever-widening field of industrial relations.

"Further opinions on this subject have been quoted by various authorities. For instance, WATKINS,[6] in 1920, expressed the following view: 'It took the medical profession quite a while to realize that the possession of a sound medical education did not, per se, qualify a man to adequately carry on the duties of a health officer. The profession has likewise been somewhat slow to recognize that the acquisition of sound surgical technic or skilled diagnostic ability does not qualify a man to carry on the duties of an industrial physician.' DR. A. J. LANZA,[8] who in 1931 was Chairman of the Section on Preventive and Industrial Medicine and Public Health of the AMA, stated in his chairman's address in Philadelphia: 'Although there are able and experienced industrial physicians competent to deal with any situation which may confront them, one still finds all too frequently physicians who have no real appreciation of the nature and effect of working conditions and only an imperfect conception of the pathology, symptoms, treatment or prevention of specific occupational diseases.'

"A hasty perusal of these opinions and points of view will lead to the inevitable conclusion that the industrial physician and surgeon who functions properly covers a wide range of activities within and without the organization to which he may be attached."

—*Continued on page 98.*

This magazine is published to promote sound thought upon and concerning industrial medicine and traumatic surgery. To that end it will contain articles, news items, reports, digests, and other presentations, together with editors' comments. The editorial policy is to encourage frank discussion. On this basis contributions are invited.

Industrial Medicine

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The editors will exercise care in checking on the accuracy of data printed, but in all other respects articles and opinions of which expression is allowed are the opinions of their authors—the editors reserving in all cases the right to comment on the same, in the current or any subsequent issues, as they may be inclined.

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The Science, the Law and the Economics of Industrial Health

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Records—The "Seeing Eye" of Industrial Medicine

WILLIAM J. FULTON, M.D.,
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Baltimore, Maryland

THE stress placed on all matters pertaining to industrial safety and health—first, by the national crisis, and now by a state of war—but serves to emphasize the even greater importance of these matters in time of peace.

Once upon a time the benefits of medicine were dispensed through oracles and the gods. Long before that, way beyond the written record of man, there always was some form of medicine. The background of surgery fades into the prehistoric. Through it all runs the thread of hygiene, public health, and occupational medicine. Not so very long ago, diagnosis and treatment depended on nothing more than the inspection of a single specimen of urine. Gradually the art has grown, embracing and combining one after another of the sciences into modern medicine. There has been no short cut to this modern medicine. The road has been the way of hard work, spurred by the instinct in man to redeem man. The future advance will continue by no other route.

"The present is the sum total of the past." Had man left no records, the present "sum total" would be infinitely less. We are what we are, largely because of records, and the future "sum total" is moulded by what we, in turn, add.

While the records we are discussing are, in general, written accounts of facts or events, chronicled by man, there are other records left by other than human hands, such as the geological tracings imprinted by nature. All have added to our present knowledge and shall continue to add unless, as in the Dark Ages, the forward march of knowledge is set backward or made static by the destruction or suppression of records.

One attempting to interest himself in industrial health and safety is likely to be left in a daze because of the many ramifications of the subject. The pertinent records that we are going to discuss will, in all likelihood, leave many in a daze because of their ramifications. Nevertheless, industrial medical records are vital, and their organization and proper placement in relation to any industrial safety and health program are of paramount importance. It is my firm conviction that maintaining such records at a high standard, and *USING* them, will eventually add more to the science of Industrial Health—and, I add, Public Health—than any other type of individual or collective record.

THE full-time role of medicine in industry is comparatively recent. Originally directed toward repairing the mistakes resulting from the lack of human engineering, it was, in the main, a part-time, contract, or insurance profession. Those original conditions have undergone progressive and consistent change. The increasing itinerary of services expected of and properly assigned to an industrial medical department has gone far beyond the mere care of injury, and points steadily toward administering all phases of preventive medicine and public health. Safety engineering has advanced the mechanical safeguard toward a waning necessity for the full-time Industrial Surgeon. That term is on its way out. The occasional future need in industry for such service will eventually be met by a specialist—the TRAUMATIC SURGEON: the full time role will be met by another specialist — the INDUSTRIAL PHYSICIAN. He, with his staff, will be the health officer of the factory, the maintenance engineer of the human tools, and the director of research to improve the health, safety, environment and efficiency of those tools. Eighty percent of his value will lie in administrative applied prevention.

Of all the tools used by industry, the human tools are the most important. They cannot be standardized, maintained or improved by any totalitarian panaceas. There is but one way to deal with them and that is to recognize each one as a unit of physical and spiritual personality. The first duty of medicine is to the individual. Regardless of the great numbers involved, industrial medical departments should never lose sight of this ideal. Holding to it will best serve industry and the nation. Therefore, in recording their experiences, industrial medical departments should make the INDIVIDUAL their FIRST AIM.

Of necessity, such records must be of a simplicity capable of accumulating the maximum information concerning each individual with the least cost of time, effort, and space. They should be records of a high degree of efficiency in their practical application; readily accessible

Presented at the Industrial Nursing Session, Thirty-Second National Safety Congress, Chicago, October 6, 1943.

records that, day by day, can be consistently applied toward bettering and studying the safety, health and environment of each and every individual; *records to use—not simply to file.*

We must never lose sight of the values, rights and dignities of the obscurest individual. However, the better to understand man, we must look beyond the individual man, and his individual actions and interests, and view him in combination with his fellows and his work. To view him and his record in combination with his work, we must know something of that work. It is, therefore, essential that industrial medical personnel educate itself in the geography, anatomy, and physiology of the factory, and in all phases of its activity.

This brings up the SECOND AIM of our recording: namely, to organize and arrange our individual records in such manner that all possible statistical comparisons may be made — comparisons by occupation, age, populations, and numerous other groups. Intra-factory group comparisons are quite capable of uncovering and controlling accident and occupational epidemics at present unsuspected. Keeping data available as a source of such research will greatly increase knowledge of what may be termed "collective pathology." This second aim brings to mind these words of Osler's: "If you have the good fortune to command a large clinic, remember that one of your chief duties is the tabulation and analysis of the carefully recorded experience. Keep and compare your observations. Study them, tabulate them, seek the points of contact that may reveal the underlying law. Some things can be learned only by statistical comparison." Where, pray tell, is there a greater opportunity to live with and study, over a long, long period, a cross section of humanity? Where is there another such clinic to study not only the injured and sick but the SAFE and HEALTHY as well? Ours is a great opportunity.

While not the immediate concern of an industrial physician or an industrial executive, our records should be capable of all forms of *national* statistical comparison—this, if for no other reason, being an obligation of good scientific citizenship. There is great need for such data and, if forthcoming, the science of industrial and national health will be immeasurably advanced.

Our THIRD AIM and, we believe, a very important one, is to translate our observations and records into a language common to and understood by industry. By nature of their very calling, industrial executives are extremely practical fellows. The languages of the physician and the vital statistician are foreign to them, and they show little inclination to master those vocabularies. What the average industrial manager wants to know is that which goes on in relation to the safety and health of his own employees, in his own plant, and it is part of our job to shape our records and interpret our opinions to fulfill that requirement. We should adapt our language to that of industry and not expect (as is so often the case) industry to adapt its understanding to that of the profession.

The FOURTH AIM is to create some form of yardstick or measuring rod as a basis for evaluating the effectiveness of safety and health administration. The opportunity afforded us in having a large group of people under constant observation suggests the creation of another basis of measure; namely, a measure that will indicate the "collective" trends in health and safety. Widespread use of this latter form of measure by industry is a potential for vast future contributions to the science of national public health and safety. Let us emphasize this important point—*that any basis of measure be simple and easily understood by management.*

The most immediate mental association with the word "SAFETY" is some form of mechanical accident that results in personal injury. Accidental injury, however, cannot be confined to the mechanical. Let us consider an accident as a "departure from or unbalancing of any of the components of normalcy that results in adversity." The various

DIRECT

Medical Service

		Percentage
1. Treatment of all injuries—		
Compensable	36%	
Personal	5%	41%
2. Surgical redressings		25%
3. Initial treatment of medical complaints		26%
4. Checking, as to fitness for work, those absent because of any physical complaint		8%
Clerical recording time included.		100%

Time Study Requirement *per Case* 10.29 Minutes

Hospital Time invariably consists of—
70% Treatment Time
30% Clerical Recording Time

INDIRECT

Medical Service

1. Care and sterilization of instruments
2. Preparation of dressings
3. Hospital supplies
4. Follow-up of cases
5. Clearance of files
6. Compensation and other special reports
7. Correspondence, etc.

Average time requirements *one-eighth* of direct time requirement, or *1.28 minutes per case*

Total Time Requirement per Case ..... 11.57 Minutes

$$\frac{\text{8-Hour Day or 480 Minutes}}{\text{Time Required per Case 11.57 Minutes}} = 41.48 \text{ Cases}$$

One Nurse or Attendant can give *good quality* service to not more than *41 cases per 8-hour day*

GENERAL RULES

1. In shifts of 8 hours or more—each *120 man hours* will produce *one* direct service case
2. In any *one shift*—each *15 employees* will produce *one* direct service case

41 Cases × 15 Employees = 615 Employees

615 Employees in one shift will produce sufficient direct service cases to keep *one* nurse or attendant completely occupied

Fig. 1.

items bringing about this departure or unbalancing we call a "hazard." There are myriad hazards, any one capable of causing an accidental injury. There are occupational hazards; hazards of environment and heredity; psychological, emotional, and mental hazards; sex hazards; hazards of communicable disease, nutrition, physical disabilities, job placement, faulty supervision, misjudged aptitude, and so on—hazards without end. Therefore, while I am aware that this is a safety convention, it would be quite impossible to confine medical records to one particular phase of safety, nor should medical records be *"single tracked."* Your records should cover the broad panorama of humanity. However, the coverage must not be so broad that it fails to produce data that can be practically concentrated on any single phase within the panorama.

A quarter of a century ago three children were adopted by industry. They were named Personnel Direction, Safety Engineering, and Industrial Medicine. Over the intervening years, each—like Topsy—has "growed and growed" until today each is a specialty in its own right. The scope of each has now become too vast to admit that any one of these specialties is *master* of all three. All have the same general objective. They are equally important. Experience fosters the opinion that each will attain maximum progress and results if left to its own devices. Their overlapping activities, now extant, create the necessity for some machinery in industry which, without attempting to direct, will evaluate, coordinate and apply the fruit of the labor and research of these three departments. As our theme develops, the need for such machinery will become apparent.

Let us dispense with further generalities pertaining to our subject and build, step by step, a system of records that will attain the aims we have outlined.

STARTING point number one—and the point on which all to follow hinges—is the *adequate manning* of an industrial medical department to give prompt and efficient service, and to maintain records that meet minimum standards. Time and motion study and job planning bear as important a relation to the efficiency of a medical department as they do to the efficiency of any other production department. Of course, patients don't come through the dispensary on a conveyor belt, and timing the medical service rendered

HOSPITAL PERSONNEL REQUIREMENT
ONE SHIFT
VARYING NUMBERS OF EMPLOYEES

ALL SERVICE PLUS PROGRESS in Safety Hygiene Research Prevention Cooperation Conservation Etc.-

PERSONNEL	DIRECT SERVICE ONLY	DIRECT PLUS INDIRECT SERVICE	ALL SERVICE PLUS PROGRESS	MAN HOURS
One Nurse	768	672	600	4800
Two Nurses	1536	1344	1200	9600
Two Nurses and One Clerk*	2304	2016	1800	14400

*Each 8 hours of active dispensary practice
consists of - - - - - - (70%) - - 5.6 hours
of direct attention to injured or ill employees
And - - - - - - - - - - - - (30%) - - 2.4 hours
of necessary clerical recording
8 hours

Two nurses can take care of 1200 employees and do the required clerical work, but when the 1800 employee mark is reached, there will be a daily clerical requirement of 7.2 hours. At this point a full time clerk is added to release the two nurses for professional duties to sick and injured only. As the number of employees rises, the hospital personnel is increased by this same cycle.

Fig. 2.

them is not like timing a mechanical operation. However, the rate of flow follows a generally constant pattern, influenced by fatigue and other factors. Experience has also taught that a given number of employees will produce a fairly constant number of cases within a shift or within a definite span of man hours.

We will briefly review the services of an industrial medical department, exclusive of physical examinations or physician's time, and call them the Direct Service Items (Fig. 1).

The time required to attend to the wants of each of these patients varies with different types of service, and each service calls for many timings in order to arrive at an over-all average. Analysis of 10,000 stop-watch studies of all types of plant hospital service resulted in our 11.57 minutes. We feel confident it is applicable to the great majority of medium-type industries, such as airplane and automobile assembly plants. Now 11.57 minutes will go into an eight-hour day (480 minutes) a fraction over 41 times, which leads to the conclusion that one nurse can take care of the direct and indirect services to not more than 41 cases per day—if those services and records are to be of good quality.

Two other *general rules* may be laid down here; namely, first, that where shifts are eight or *more* hours in duration, a case seeking one of the items of direct service just outlined will come through your doors for every 120 man hours worked; and, second, during any single shift, one case for every 15 employees working will seek some form of service.

You nurses who have records covering a year and more than a half-million man hours may put this to the test. We feel that you will come quite close to these conclusions. Should one or more of the various direct service items be absent from your itinerary, your results will of course vary by the approximate percentage of that or those items.

This second general rule (one case per 15 persons per shift) leads to another conclusion; namely, that 41 times 15, or 615 employees, working on any one shift, will produce sufficient direct service cases to keep one plant dispensary nurse or attendant completely occupied. The number of cases per day produced by 615 employees will range from 32 to 50.

Consider that this service is required only for the cases that come through your doors, and that we have left out physical examinations—which, exclusive of physician's time, require from 10 to 17

Fig. 3.

minutes of hospital personnel time. Add this consideration to the foregoing and we have a basis for calculating the necessary hospital personnel to give adequate service and produce records of the type that we are going to discuss.

In the table shown as Fig. 2 we set down what we believe to be a minimum, basing it on a flat 10 minutes for direct service and 1.25 minutes for indirect service—a total of 11.25 minutes per case. In the types of industries mentioned, manning below this minimum will not, in our opinion, produce adequate service. A startling amount of production time can be lost through the inefficiency of an undermanned medical department, to say nothing of the costs and poor quality of service. Every penny's worth of bad medicine that results from under-manning will be multiplied to a dollar's worth of bad personnel relations.

Finally, if industrial medicine is to get out of the flat cost bracket and is to enter the field of practical applied prevention, it must be additionally manned. It is only in the range *above* personnel adequate to care for the direct service that industrial management is justified in expecting returns on medical investments in reduction of accidents, occupational hazards, sick absenteeisms and insurance premiums, and an improvement in personnel relations and environmental hygiene. There must be additional time and personnel allotted if the fruit of our labors is to be applied and our activities carried beyond the confines of our dispensary walls.

I hold the medical department second to no other industrial department as a source of safety promoting material. An accident does not begin with an injured man. It frequently forecasts itself by nothing more than a remark. Here is an example. A workman is in the dispensary, having a minor abrasion dressed. The nurse notices his torn shoe, and friendly questioning brings forth the following exclamation, "Boy! What it could have done to my foot!" This, and every similar remark—no matter how trivial—made in the dispensary, is a signal for immediate contact with the safety director. Hospital personnel should be ever on the alert for them. The first photograph records the hazard (Fig. 3). A camera is an excellent stimulant to action. A report crosses management's desk within the hour. The next photograph was taken the following morning (Fig. 4). The plant engineer has seen to it that no foot will ever be caught in that exposed conveyor chain pulley.

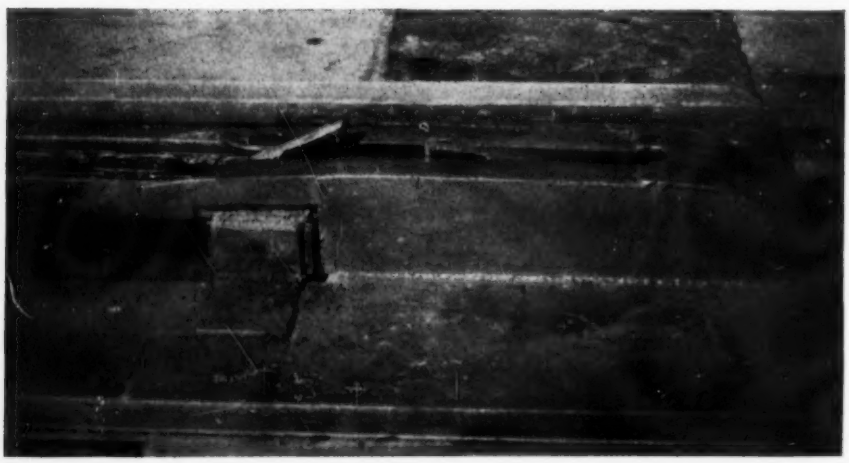


Fig. 4.

Now let us start our industrial patients through the dispensary and lay the foundation of our records. Fig. 5 shows a 3 x 5 form, carried in pads by the foreman, front and reverse sides. Emergencies excepted, all must present it. It is made in duplicate. An automatic time clock stamps the time of dispensary arrival and departure. The duplicate is returned by the patient to the foreman. On this pass the foreman has noted the name, clock number, and time of the accident, and has indicated by an "X" the exact spot in the plant where the injury occurred (Fig. 6). The upper half is the pass as presented to the dispensary; the lower is the same slip after the dispensary personnel adds the following data: in the upper left corner, the anatomy — such as face, arm, eye, cornea, leg, etc.; in the upper right corner, the type of injury—such as laceration, puncture wound, burn, fracture, embedded foreign body, etc., and, across the top, the date is stamped. These slips are sorted and filed as to type of injury, the most recent *date* in each type of injury *being kept forward.* We call this the Accident Prevention File (Fig. 7). It is kept up to date, and at all times is at the disposal of the director of safety. The use of this pass as an instrument of accident prevention will be demonstrated later.

Aside from safety, this pass has several other attributes worth mentioning. It gives the supervisor a control over one of the whereabouts of his charges. It prevents waste of production time by loitering. It partially regulates the flow of surgical redressings and minor complaints through the plant dispensary. The psychological effect discourages the literally unnecessary visits by the "dispensary habitue," thus relieving the staff of a time-wasting burden.

Fig. 8 shows the 5 x 8 Surgical Card, on which is recorded the complete history of any injury, from admission to discharge. (This and

PASS TO MEDICAL DEPARTMENT

Name - _____ No. - _____

Department - _____ Time - _____ AM PM

Operation - _____

Reason - _____

Date - _____

North

LOCATION

(over) Foreman

ARRIVED at Hospital | LEFT Hospital

Returned to Foreman

REMARKS -

Fig. 5.

all similar forms have been whittled by experience to a point that will satisfy maximum simplicity and practical adequacy.) A portion of the information may be transcribed from the Pass to the Medical Department. The address is not recorded routinely. There is a space to note the "shift." Three points should be stressed:

1. The exact time and date of the occurrence of the accident or onset of the complaint.
2. The exact time and date of the initial report by the patient.
3. Meticulous recording of the employee's statement in *his own words* and, preferably, in his presence.

None of these things should be left for an instant to memory. It is best that the diagnosis and treatment be recorded by the professional attendant. The reverse side holds the record of subsequent redressings or treatments.

Fig. 9 is the record of the eye injury, the Pass to the Medical Department for which was just presented.

A few remarks are in order here on the tendency to high-light the importance of "potential legal defense" in the making of medical records. Ascertaining the true facts regarding injury or illness is more important medically than legally. Stressing the legal side is apt to promote an attitude of distrust for your patients. It is bad medicine. The ratio of *unjustified* claims to the total number of injuries and complaints treated by industry is infinitesimal, almost to the point of obscurity. Make GOOD MEDICAL RECORDS and any need for legal application will be met automatically.

These Surgical Record Cards (Figs. 8 and 9) are filed alphabetically. The "Closed" cases are cleared constantly to a permanent file, thus leaving the active file (cases still under treatment) at a minimum number.

To facilitate the recording of redressings in a busy dispensary, each staff member has a Redressing Sheet for each shift (Fig. 10). On it, they record the time, name, clock number, treatment and progress note of each case handled. These are subsequently entered by the same staff member on the reverse side of the Surgical Card, and checked off on the Redressing Sheet. These sheets lend themselves readily to summing up the

PASS TO MEDICAL DEPARTMENT

Name - Joseph Giborowski No. - 1-174

Department - Body Time - 11 15 AM PM

Operation - Metal finish

Reason - Something flew in eye

Date - 6/6/39

E. Draper

North

P19 | 18

X

919 | 18

LOCATION

(over) Foreman

EYE CORNEA — MON JUN -6 1939 — EMBEDDED FOREIGN BODY

PASS TO MEDICAL DEPARTMENT

Name - Joseph Giborowski No. - 1-174

Department - Body Time - 11 15 AM PM

Operation - Metal finish

Reason - Something flew in eye

*Sent to specialist. Discing - No Goggles. Metal.

Date - 6/6/39

E. Draper

North:

P19 | 18

X

919 | 18

LOCATION

(over) Foreman

Fig. 6.

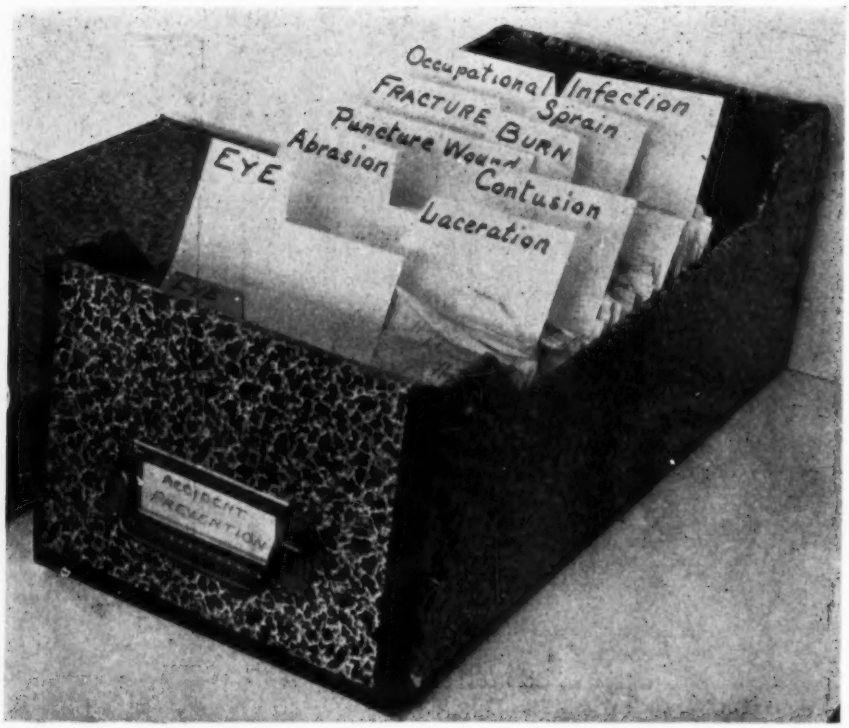


Fig. 7.

total number of revisits at the end of the shift.

The 3 x 5 card shown as Fig. 12 holds the record of each initial medical complaint—the diagnosis, treatment, and the final disposition of the case. When the severity of the symptoms warrants sending the patient home, a duplicate "Pass Home for Sickness" is made out (Fig. 11); one copy is attached to this card and the other passes through the personnel department. These cards are filed alphabetically in a permanent yearly file.

When an employee is absent from work or late, the clock card is replaced with a red "Absent Report" card (Fig. 13). If the absence or lateness is due to any type of physical condition, the employee must pass through the dispensary for a check-up before being allowed to return to work. This is obviously a valuable safety and health protective measure. The dispensary staff indicates the ability or inability to return to work on this card and returns it, along with the employee, to the personnel department. In order to keep track of the number of these (absentee) cases, a tally sheet (Fig. 15) for each shift is kept near the files. On this, each case is indicated by a small pencil mark. This sheet is also used to record those cases of injury that require treatment by outside surgical or medical consultants.

When the physical condition of an employee, following injury or illness, indicates a change in work, a 3 x 5 slip (Fig. 15-A) is made out in duplicate—one copy going to the supervisor, the other copy being

SURGICAL SHIFT 1 2 3

NAME DATE OF ONSET A.M P.M

ADDRESS DATE OF REPORT A.M. P.M

CLOCK No PLANT AGE DEPARTMENT

FOREMAN OCCUPATION LOCATION

EMPLOYE'S STATEMENT

DIAGNOSIS

TREATMENT TREATED BY

DATE	TREATMENT	NEXT TREAT-MENT	TREATED BY

Fig. 8.

SEVERE INJURY SURGICAL ENTERED SHIFT XX 1 2 3

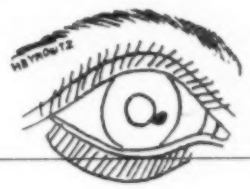
NAME GIBORORowski, Joseph M DATE OF ONSET Tue. June 6, 1939 11:15 A.M. P.M.

ADDRESS 14 S. Potomac St. DATE OF REPORT " " " 11:20 A.M. P.M.

CLOCK No 1-174 PLANT E.A. AGE 31 DEPARTMENT BODY

FOREMAN Draper OCCUPATION Utility Man LOCATION PQ-18-19

EMPLOYE'S STATEMENT "I was discing, when something struck me in the eye. I think it came from a workman next to me who was grinding. I was not wearing my goggles"



DIAGNOSIS Metallic foreign body deeply embedded in cornea, right eye, edge of pupil, 4 o'clock

TREATMENT Surrounding corneal tissue appears burned. Foreign body is deeply embedded close to the pupil.---send to specialist TREATED BY Dr. F. M.A.

Sent to Dr. Anderson, -- left 11:40 A.M.
returned 1:10 P.M.

Fig. 9.

clipped to the employee's medical record card.

At the end of the shift, the Surgical Cards, Redressing Sheets, Medical Cards, Passes Home for Sickness, and Absentee Tally Sheets can be quickly totalled, divided into men and women, and entered on the Daily Hospital Report (Fig. 17). This report is made up for each 24-hour, three-shift, period. This same form serves to hold the total monthly, quarterly, or annual report, copies of which are forwarded to management, personnel and safety departments.

In order to facilitate the making up of monthly reports, a time and labor-saving "Recap Sheet" (Fig. 14) is used. It measures 17 x 11 inches, has 31 horizontal lines, and columns for the items recorded on the Daily Hospital Report form. The totals from the Daily Report are entered on this sheet every day. When the end of the month (or any other period) is reached, we are in a position to arrive at our totals quickly. It is from such data, kept over a long period of time, that our time studies and calculations to determine adequate hospital personnel are made.

UP TO THIS point we have covered the standard routines of industrial medical recording. As time goes on, the great accumulation of these individual cards attains enormous proportions, and their contained data becomes increasingly inaccessible. Many attempts have been made to overcome this. Large forms have been drawn up for each employee, on which are recorded chronologically surgical and medical episodes. This made for bulky envelopes and time-consuming scanning of long histories. If the legal necessity arose, the one issue before the court was confused and complicated by the innumerable other items recorded on either side of it. Because of this latter observation, we retained the individual cards. At the same time, we early felt a great need of a system for condensing our clinical material that would meet all of the aims outlined in our introductory remarks. By the method of trial and error, we have

REDRESSING SHEET

By:_____
Name of Nurse or First Aid Attendant

DATE:_____ SHIFT:_____

VACCINES	REDRESSINGS	PATIENT SEEN BY DOCTOR
Time:	Time:	Time:

Fig. 10.

PASS HOME FOR SICKNESS OR INJURY

DATE _____ TIME _____

TO FOREMAN: _____

MR. _____ CLOCK No. _____

SHOULD GO HOME AT _____ BECAUSE OF { INJURY ☐ SICKNESS ☐

ESTIMATED LOSS OF TIME _____ DAYS.

(SIGNED) _____
PLANT HOSPITAL

PASS HOME FOR SICKNESS OR INJURY

DATE Nov. 15, '38 TIME 10 40 AM

TO FOREMAN: MR. DRAPER

MR. Joseph Gibororowski CLOCK No. 1-174

SHOULD GO HOME AT once BECAUSE OF { INJURY ☐ SICKNESS ☒

ESTIMATED LOSS OF TIME 5 : 14 DAYS.

(SIGNED) Wm. J Fulton M.D.
PLANT HOSPITAL
per. M.A.

Fig. 11.

arrived at a system which has put romance into the "little things" of industrial practice, so often called the "boring routine." As it has developed, it has opened vistas of potential value to industry and the nation. We feel that future progress will open further vistas.

Attention is called to two facts in regard to the development of our records from this point on: First, it adds one minute and 10 seconds to each direct service case (including totalling the data and filing the Pass to the Hospital) and has been included in our time of 11.57 minutes per case; secondly, this system need not disrupt or displace any system or type of recording now in effect, but may be installed as a valuable adjunct to it.

From here on we make our individual records LIVE.

Based on day-to-day experience, we have developed a 5 x 8 reversible card, divided in 512—¼ in. x ½ in. sections (Fig. 16, p. 10). It is divided into a Surgical and Medical side, and is capable of holding, in code, a 10 to 15 year record (for the average employee) of every injury and medical complaint (on the job), along with other items (entered in code on Medical side) such as periods of employment, leaves of absence, physical examinations, personal contacts, etc. We call this form the Index Record of Plant Hospital Service.

The entire Surgical Code (injuries) is shown in Figs. 18-1, 2, 3, 4 (pp. 12-15). We will not discuss this code other than to point out that it consists of a minimum of symbols, has been based on practical experience, permits further additions to its present construction, and can be easily mastered in two weeks' practice by any grammar school graduate. It's a simple form of industrial medical shorthand.

Let us return to the Surgical Record card of our eye injury case, and enter it on our Index Record (Fig. 20, p. 14). A circle surrounds this particular entry of June 6, 1939, and the code indicates a "foreign body embedded in the cornea of the right eye, the injury being considered of a severe nature."

Now let us enter a Medical Record card for the same individual (Fig. 19, p. 13). A circle surrounds this particular entry of November 15, 1938, and the code indicates that the patient was "Suffering from an acute peritonsilar abscess and was sent home." The complete Index Record of this individual covering

MEDICAL SHIFT 1 | 2 | 3 A.M. P.M.

NAME _____ DATE _____

CLOCK No. _____ PLANT _____ AGE _____

COMPLAINT

DIAGNOSIS

LOCATION

TREATMENT

REMARKS

MEDICAL SHIFT 1 | 2 | 3 10-30 A.M. P.M.

NAME Gibororowski. Joseph — DATE Tue. Nov. 15, 38

CLOCK No. 1-174 PLANT E.A. AGE 30

COMPLAINT Sore Throat - Chills. Temp. 100.2

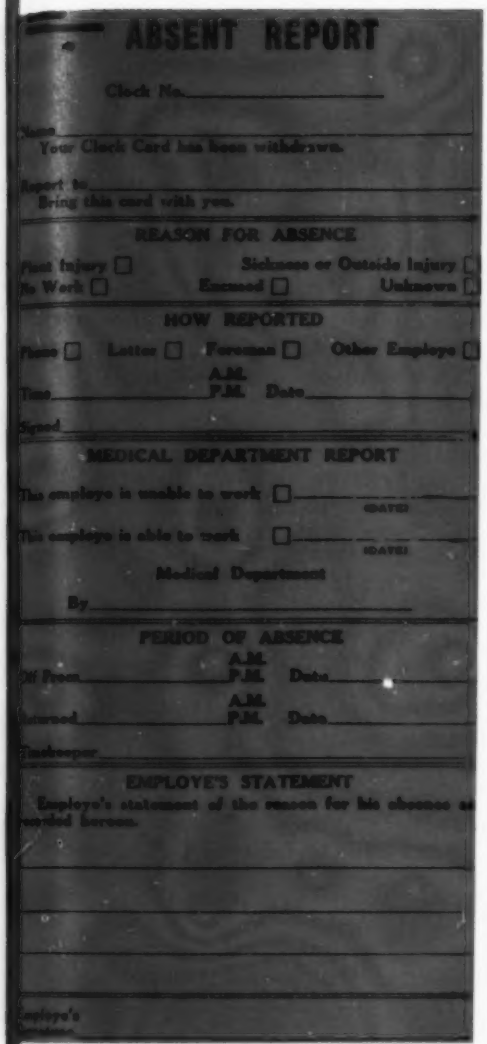
DIAGNOSIS Peritonsilar Abscess P.Q. 18:19

LOCATION

TREATMENT Aspirin grs X. Throat mopped ☓ Iodine & glycerine.

REMARKS Sent home to family physician. Check on return W.U.F. M.A.

Fig. 12.


ABSENT REPORT

Clock No.

Name

Your Clock Card has been withdrawn.

Report to

Bring this card with you.

REASON FOR ABSENCE

Plant Injury ☐ Sickness or Outside Injury ☐
No Work ☐ Excused ☐ Unknown ☐

HOW REPORTED

Phone ☐ Letter ☐ Foreman ☐ Other Employe ☐

Time A.M. P.M. Date

Signed

MEDICAL DEPARTMENT REPORT

This employe is unable to work ☐ (DATE)

This employe is able to work ☐ (DATE)

Medical Department

By

PERIOD OF ABSENCE

Off From A.M. P.M. Date

Returned A.M. P.M. Date

Timekeeper

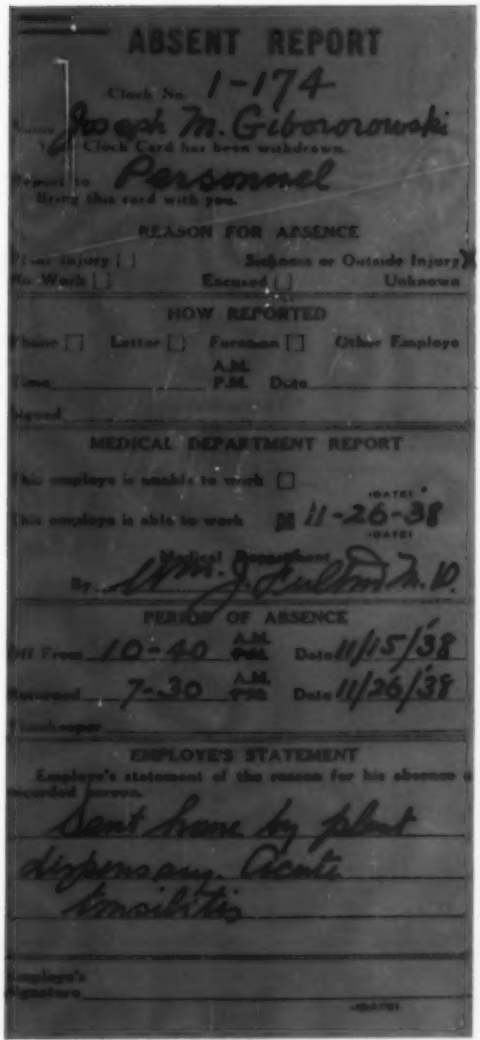
EMPLOYE'S STATEMENT

Employe's statement of the reason for his absence as recorded hereon.

Employe's Signature

a period of years is shown in Fig. 21, p. 15.

To have signed and returned to the personnel department the red Absent Report card, without further ado, would have thrown away the opportunity to record sick absenteeism. We have taken advantage of it for some years. Fig. 24 is the 5 x 8 card designed to hold sick absenteeism data. It is a simple form, carrying two columns down the right side which indicate "calendar days" and "working days." Here we enter a record of sick absence for the same individual (Figs. 22 and 23). The last entry shown on this record is made from our red Absent Report of November 26, 1938. The standing orders for sick absent recording are as follows, from left to right; first, the day of the week and date of the employee's return; next, the "off date" or date of the onset of disability, including the day of the week. (In both instances, we stress THE DAY OF THE WEEK.) Next the diagnosis. If the employee had no medical attention of any kind and makes his own diagnosis, put it down in his own words and always put quotation marks around it. If the diagnosis is professional, i.e., by dispensary staff or via a physician's note, record it WITHOUT quotation marks. Any note from a physician is filed in an envelope bearing the physician's


ABSENT REPORT

Clock No. 1-174

Name Joseph M. Giborowski

Your Clock Card has been withdrawn.

Report to Personnel

Bring this card with you.

REASON FOR ABSENCE

Plant Injury ☐ Sickness or Outside Injury ☒
No Work ☐ Excused ☐ Unknown ☐

HOW REPORTED

Phone ☐ Letter ☐ Foreman ☐ Other Employe ☐

Time A.M. P.M. Date

Signed

MEDICAL DEPARTMENT REPORT

This employe is unable to work ☐ (DATE)

This employe is able to work ☒ 11-26-38 (DATE)

Medical Department

By Wm. J. Fulton M.D.

PERIOD OF ABSENCE

Off From 10-40 A.M. P.M. Date 11/15/38

Returned 7-30 A.M. P.M. Date 11/26/38

Timekeeper

EMPLOYE'S STATEMENT

Employe's statement of the reason for his absence as recorded hereon.

Sent home by phone dispensary. Acute bronchitis

Employe's Signature (DATE)

Fig. 13.

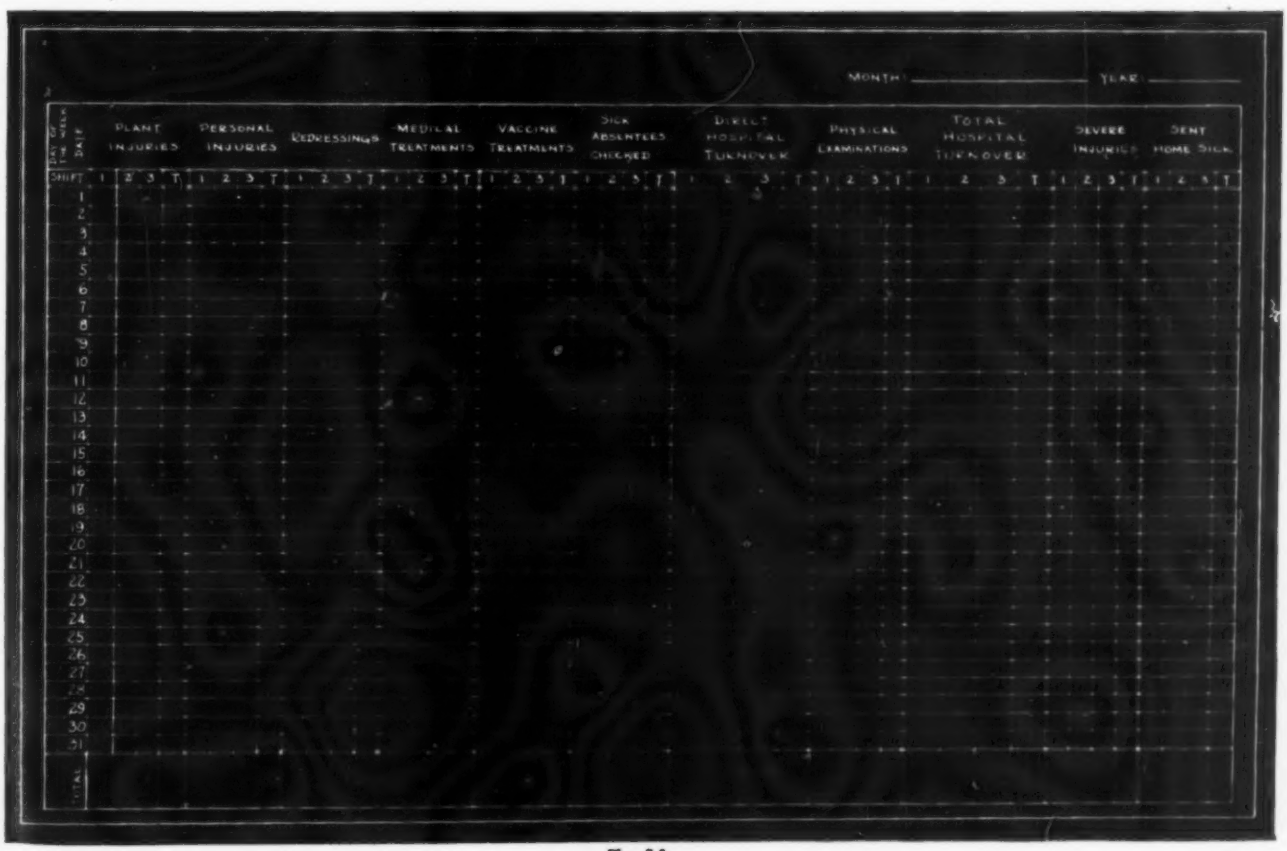


Fig. 14.

SICK ABSENTEES RETURNED TO WORK Date: _____

EASTERN AIRCRAFT

1st SHIFT		2nd SHIFT		3rd SHIFT	
MEN	WOMEN	MEN	WOMEN	MEN	WOMEN

SENT TO OUTSIDE DOCTOR or HOSPITAL FOR CONSULTATION or TREATMENT

EMPLOYEE'S NAME	NUMBER	TREATMENT REQUIRED	DOCTOR'S NAME	TIME AWAY FROM PLANT	
				Left	Ret'd

MEDICAL DEPARTMENT
BALTIMORE, MARYLAND

ABSENTEE TALLY SHEET

Fig. 15.

name. The presence of such a note in the file is indicated on the Absent record. Keeping such a physician's file is of great value. Lastly, the time lost is recorded in calendar days and working days, the definition of the latter being "a day during which the plant was actually operating and work was available." The complete Sick-Absent Record of the individual, covering a period of years is shown in Fig. 25, p. 16.

We are not going to discuss pre-employment and periodic physical examinations in detail in this presentation. They should be mentioned, however, in order to complete our individual record. A filled form, together with rating symbols and explanatory notes, is shown in Fig. 27 (pp. 18 and 19). The examination form has been greatly simplified, and folds to a 5 x 8 size. All practical data derived from each examination, that is of value in proper placement, together with medical department ratings, etc., are forwarded to the employment and personnel departments on the *Request for Physical Examination* form—shown in Fig. 26, p. 17.

These three records (Physical Examination, Index and Absent) are kept together as one unit in a pocket. The pockets are filed alphabetically in trays. The battery of trays shown in Fig. 28 holds the

EA 1502

SURGICAL

INDEX RECORD
OF
PLANT HOSPITAL SERVICE

MEDICAL

NAME LAST FIRST MIDDLE SOCIAL SECURITY NO DATE FIRST EMPLOYED

TYPIST PLEASE NOTE—THIS SCALE CORRESPONDS TO TYPEWRITER (PICA) SCALE—SET PAPER GUIDES SO THAT CARD SCALE WILL REGISTER WITH MACHINE SCALE WHEN CARD IS TURNED INTO WRITING POSITION. START INDEX THREE (3) POINTS FROM LEFT EDGE OF CARD. USE OTHER POINTS OF SCALE FOR OTHER DIVISIONS OF VISIBLE TITLE. SET TABULATORS TO INSURE PERFECT ALIGNMENT OF EACH DIVISION OF INFORMATION. FOLD BACK OR REMOVE STUB AFTER TYPING. [illegible] NEW TYPEWRITER RIBBON

Fig. 16.

NOTICE OF RETURN TO WORK

DATE_____

TO MR._____ FOREMAN

NAME_____ NO._____

IS ABLE TO DO REGULAR WORK—NATURE
LIGHT WORK

MEDICAL DEPARTMENT

BY_____

When the condition of an employee—following injury or illness indicates a change in work this 3 x 5 slip is made out in duplicate—one copy going to the Supervisor, the other copy being clipped to the employee's medical record card.

Fig. 15-A.

records of 2400 employees. These files are kept handy to hospital staff and can be locked. In Fig. 30, we see one of the trays pulled out, and a close-up of one of the trays. The name, social security number, and hiring date are visible through a ⅜-in. window at the bottom of the card. (Names are also placed at the top of all cards should *vertical filing* at any time be used.) A number of varicolored guide signals can be inserted in the visible portion of the record. Entries may be made on these records, and tabulations of every description are possible, without removing the cards from the pocket or tray. Trays can be positioned to serve as a desk, or, if desired, an entire tray can be removed from the cabinet.

To illustrate the arrangement of these three records in each pocket, we show three views of the same tray and pocket, in Fig. 29. On the left is the index record (the one used most frequently), kept on the front side. In the center the pocket has been turned up to show the record of absence kept on the reverse side. In the photograph to the right, the lower corners of the Absent Record have been freed and the record turned upward to show beneath it the unfolded record of the pre-employment and periodic physical examinations.

Each individual pocket can be removed from the tray quickly and easily. In Figs. 31-A and 31-B the photograph on the left shows a pocket being removed, and, in the right photograph, the pocket containing the complete history and record of the individual is being placed in the hands of the physician. Thus the "maximum information concerning each individual with the least cost of time, effort, and space" is made available.

Here should be stressed the importance of keeping medical records active and up-to-date. To do this, it is essential that the medical department receive routinely the daily report of the employment department to management. This type of report contains new hires, lay-offs, transfers and various leaves of absence, etc., including names and dates. Failure to keep your files cleared, by this means, will soon find them hopelessly cluttered with inactive records, and your all-important record of *periods of employment* will be lost. Routine file clearance is especially important in times of a high rate of employee turnover.

A discussion of all of the values and varieties of application of this combination of individual records would take thrice our present al-

EASTERN AIRCRAFT

HOSPITAL REPORT DATE:_____

Shifts		First	Second	Third	Total
Plant Injuries					
Personal Injuries					
Redressings					
Medical Treatments					
Vaccine Treatments					
Sick Absentees Returned to Work—					
Direct Hospital Turnover					
Physical Examinations					
Total Hospital Turnover					
Severe Injuries					
Sent Home Sick					
WOMEN	Surgical				
	Medical				
	Vaccines				
	Sick Absentees				
	Direct Turnover				
	Physical Exam.				
	Severe Injuries				
	Sent Home Sick				

REMARKS, ETC.

Baltimore, Maryland

Fig. 17.

INDUSTRIAL ANATOMICAL CODE
Symbol for Top Line

SYMBOL		
	1	UPPER EXTREMITY
Blank		Fingers
1-		Hand
1a		Wrist
1b		Forearm
1c		Elbow
1d		Arm
1e		Shoulder
	2	EYE
2c		Cornea
2cp		Pupil
2d		Eye Ball
2e		Conjunctiva
2f		Lid
	3	LOWER EXTREMITY
3		Toes
3-		Foot
3a		Ankle
3b		Leg
3c		Knee
3d		Thigh
3e		Hip
	4	HEAD
4-		Face - general
4a		Occipital back
4b		Brow
4c		Cheek
4d		Chin
4e		Ear - external
4e1		Auditory Canal
4e2		Drum - tympanum
4e3		Middle Ear
4e4		Mastoid
4f		Frontal - forehead
4j		Jaw
4m		Mouth
4m1		Lips
4m2		Teeth
4m3		Tongue
4m4		Throat
4m5		Tonsils
4m6		Pharynx
4m7		Larynx
4n		Nose
4n1		Cartilage
4n2		Bridge

SYMBOL		
	5	TORSO
5a		Abdomen
5a2		Front
5a3		Side
5a4		Inguinal
5a5		Umbilicus
5b		Back
5b1		Lumbar
5bc		Coccygeal
5bs		Sacoral
5n		Neck
5n1		Back
5n2		Front
5n3		Side
5p		Pelvis
5p1		Illiac Bones
5p2		Ischium
5p3		Pubis
5p4		Buttocks
5t		Thorax
5t1		Back
5t2		Front
5t3		Side
5t4		Ribs
5t5		Clavicle
5t6		Scapula
5t7		Sternum
5t8		Breast
5v		Spine
5v1		Cervical
5v2		Thoracic
5v3		Lumbar
5v4		Sacoral
5v5		Coccyx
	6	GENITALS
6a		Penis
6b		Urethra
6c		Prostate
6d		Bladder
6e		Scrotum
6f		Testicle
6g		Cord - spermatic
6h		Vulvae
6k		Vagina
6m		Cervix
6n		Uterus
6t		Tube
6o		Ovary

Fig. 18-1.

lotted time. We can only enumerate a few points:

1. In dealing with large numbers, the efficiency of individual application is enhanced and the personal relationship of medicine to patient is markedly improved.

2. The time and labor saved in reviewing individual histories is tremendous.

3. The value of any therapeutic or safety measure can be swiftly and accurately evaluated, individually or collectively, the conclusions having the added weight of large numbers, backed by records of other individuals that constitute controls.

4. The groundwork for research in almost any form of occupational hazard is made available—research by groups, ages, occupations, etc.

5. Data covering a cross section of the population, for a long period of time, are made available for all forms of industrial, local, and national statistical research.

6. The actual degree of hazard to health and safety of any operation, process, occupation, material or group of materials can be accurately measured and compared.

7. The Safety Factor relevant to any operation analysis can be accurately computed.

8. The relation (if any) between sickness and accidents can be established.

These are only a few. (I would welcome hypothetical case questions along these lines.)

Imagine for a moment some similar system and code of recording adopted by all industry, and compared. The field is limitless. Such a possibility portends vast future contributions by Industrial Medicine to both industrial and national public health and safety. What a boon such records would be to a physician or nurse entering a factory for the first time and facing 2000 patients, heretofore utter strangers.

OUR individual records are now condensed into a simple, accessible unit. Before a fair and practical individual application can be realized, some base line or standard for measure and comparison must be made. For this and similar purposes, certain data are absolutely essential and should be made available to the Medical Department routinely and on a monthly basis. These essential data consist of the following items (Fig. 34):

1. Average number of employees working, preferably broken down into men, women, and shifts.
2. Man hours worked.
3. Production hours worked.
4. Number of days plant was in production.
5. Number of shifts.
6. Medical and compensation costs.

To establish our base line for measuring and comparing, we divide the total number of each of our three recorded items—namely, injuries, medical complaints, and sick absenteeism—by the average number of employees working. This produces a table of averages (Fig. 35) which may be used as a standard of measure or to compare the individual employee with his fellows. We have used two periods to illustrate how the standard may vary, by sex, in proportion to length

of the work week, or under conditions of peace or of turmoil.

Our standard is now set by which the Medical Department may rate fairly and compare accurately an employee's status in safety, medical complaints while on the job, and number of sick absenteeisms. Further, these visible, condensed records paint a day-to-day, ever-changing picture of each individual, continually singling out those who need attention in some phase of safety and health. In Figs. 32 and 33 there are four Index Records, covering a period of years. They paint a true picture of each individual. Why do men who enjoy equal rights, engage in the same occupation, and expose themselves to the same plagues and hazards react and vary so widely? The one in the lower right corner is a 71 year old machinist. He remembers no serious accident, but did have typhoid fever in 1898 while serving in the Navy.

We have always believed that medical records play a very important part in evaluating and protecting each individual employee. The pre-employment physical examination is branded as the "cornerstone" of industrial health. In so far as being an initial guide to proper placement in relation to physical qualification, it *is* the cornerstone. Subsequent periodic examinations act as "milestones" in following the physical status of the employee throughout the course of employment. What of the interim between physical examinations — the day-by-day record of the employee's visits to the factory dispensary? Experience has convinced us that this latter group of records is a more accurate appraiser of the *actual* physical status and general worth of an employee than any form of physical examination, no matter how thorough. We have further learned that this group of records is probably the earliest indicator of personal and physical deficiencies in a *new employee.*

Before we go on to the method of application and the measure of its success or failure, some further general truths should be stated — general truths that have come from repeated mass analysis of these records over a period of years and from recorded observation of those who have made these records. Repeated analyses of the *Index* Record of Plant Dispensary Service over an eight-year period invariably lead to the *same basic conclusion* (See Fig. 36, p. 22).

There are some observations pertinent to this basic conclusion that should be recorded.

INDUSTRIAL INJURY CODE
Symbol for Bottom Line

SYMBOL	
Blank	Laceration
1	Abrasion
2	EYE
2a	Embedded Foreign Body
2-	Floating Foreign Body
2b	Flash Burn
3	PUNCTURE WOUND
3	With Foreign Body
3-	Without Foreign Body
4	Contusion
4e	Evulsion
5	BURN
5	Thermal - heat
5-	Brush or Friction Burn
5a	Scald
5b	Chemical
5c	Sun
5d	Electrical
	Flash Burn - see eye 2b
6	Strain
7	INFECTION - inflammation of
7	Local
7-	General
8	Sprain
9	FRACTURE
9	Simple
9-	Compound
10	Dislocation
11	Synovitis & Tenosynovitis
12	Bursitis
13	Fatigue - muscle, etc.
14	Amputation
15	IRRITATION
15	General
15a	Mechanical
15b	Chemical
15c	Thermal
16	DERMATITIS
16a	Contact
16b	Chemical
16-	Infectious
17	Heat - exhaustion
17a	Heat - stroke
17b	Sun Stroke
18	Electric Shock
19	Arthritis - traumatic
20	Hernia
21	Concussion - cerebral
21a	Intracranial injury - hemorrhage
22	Occupational poisoning
22	Occupational toxemia
22a	Asphyxia
23	Occupational disease
24	Frost Bite

SPECIAL CODE

SYMBOL	
O	PAIN or ACHE
.	1st Shift
..	2nd Shift
...	3rd Shift
	(Dots under the date)
X	LEFT HAND SIDE of BODY
∮	SEVERE
SH	SENT HOME
P	PERSONAL INJURY
LR	LATE REPORT

Enter on Medical Side

W	WASSERMANN TEST
XW	ROUTINE CHEST X-RAY AND WASSERMANN
P_X	PHYSICAL EXAMINATION
V	VACCINES

PERSONAL CONTACT BY:

(Dr)	DOCTOR
(N)	NURSE
(•)	PERSONNEL DEPARTMENT
(S)	SAFETY DIRECTOR
(F)	FOREMAN

Day of the Month	Top Line Part of Body
	Bottom Line Type of Injury

Each Section of Index Record divided as above.
Use one whole section to designate a New Month.
Surgical and Medical are entered chronologically to compare relation of medical complaints to accident incidence, etc.

Fig. 18-2.

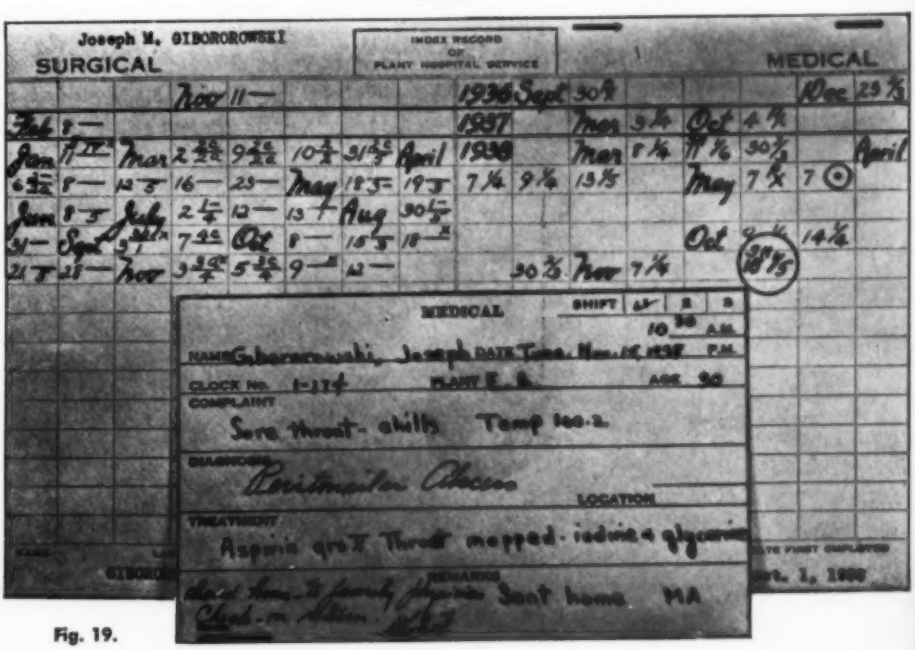


Fig. 19.

(a) Not only do the mathematical percentages remain constant, but the individual employees within the percentage groups, to a large extent, remain the *same individuals*. This holds true regardless of length of service, transfers among occupations that are hazardous by varying degrees, location in the factory, etc. There are, of course, employees who pass back and forth from one group to another, but they form a minority in each group.

(b) There is no consistent connection between the physical condition of an employee as determined by pre-employment and periodic physical examination and the plant dispensary record that the employee accumulates. We find no evidence to support the theory that employees who, at pre-employment physical examination, were found to have major physical disabilities and were classified as physically *below* average are any more prone to injury, sickness on the job, or sick absenteeism than are those who were judged to be physically *above* average.

(c) Comparison of the plant dispensary record with that of the personnel department demonstrates that a majority of those making up our basic 30% group produce the majority of problems for supervisors, and personnel and safety departments, and seem to be "in everybody's hair." It is within this group that we find the preponderance of neurotics, indigents, irresponsibles, and otherwise below-par brothers and sisters.

CODE FOR SPECIFIC ORGANS AND TISSUES

SYMBOL		SYMBOL		SYMBOL	
B	Bone	Th	Thyroid	Oe	Oesophagus
Bm	Bone Marrow	Tr	Trachea	St	Stomach
Bp	Periosteum	Br	Bronchus	Sb	Small Intestine
J	Joint	Lu	Lung	Lb	Large Intestine
Lig	Ligament	Pl	Pleura	Ap	Appendix
M	Muscle	Hep	Liver	Re	Rectum
Fas	Fascia	Gb	Gall Bladder	An	Anus
T	Tendon	Pan	Pancreas	Dur	Dura
Bu	Bursa	Sp	Spleen	Cer	Brain
H	Heart	Ki	Kidney	Ceb	Cerebellum
A	Artery	Ur	Ureter	Med	Medulla
V	Vein			Sc	Spinal Cord
Ly	Lymphatic			Sn	Spinal Nerves
				N	Nerves - general

The surgical code is frequently combined with the medical code - to indicate Medical Complaints. Whenever the horizontal line is used on the Medical Side - the symbol above the line indicates the anatomy or location. The symbol below the line - the complaint, symptom or diagnosis.

A Few Examples from the Medical Code

O - Pain or Ache	C - Cold or Coryza	Hem - Bleeding or Hemmorrhage

The numeral 7 and 7- when used below the line on either Surgical or Medical Side - or with no line on the Medical Side* always denotes - Infection and designates the suffix - ITIS.

EXAMPLES (Medical Side) - Complaints, etc.

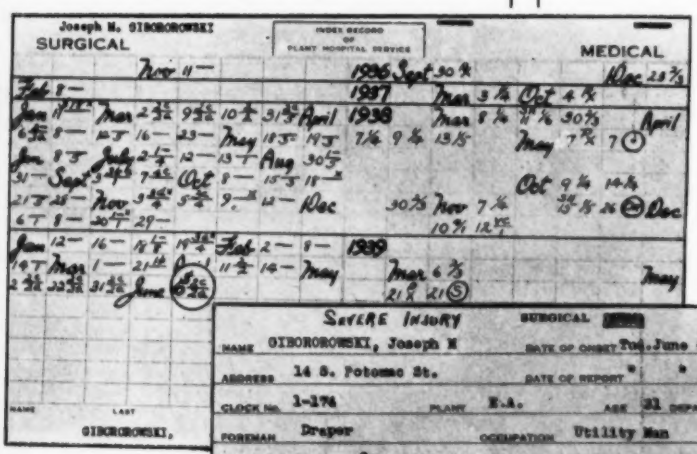
HEADACHE	4/O	COLD	C	BLEEDING FROM:	
TOOTHACHE	4m2/O	HEAD COLD	4/C	MOUTH	4m/Hem
SORE THROAT	4m4/O	CHEST COLD	5t/C	NOSE	4n/Hem
*BRONCHITIS	Br/7- OR Br 7	OTITIS MEDIA	4e3/7	ANUS	An/Hem
PAIN IN THE ABDOMEN	5a/O			CONJUNCTIVITIS	2e/7
NEURITIS - Elbow	1c/N7			ARTHRITIS - Knee	3c/J7

When several types of injuries occur to one part at one time - the most severe only is coded.

In some instances it may be necessary to use two or more sections.

Medical Department
Eastern Aircraft Baltimore
Division General Motors

Fig. 18-3.



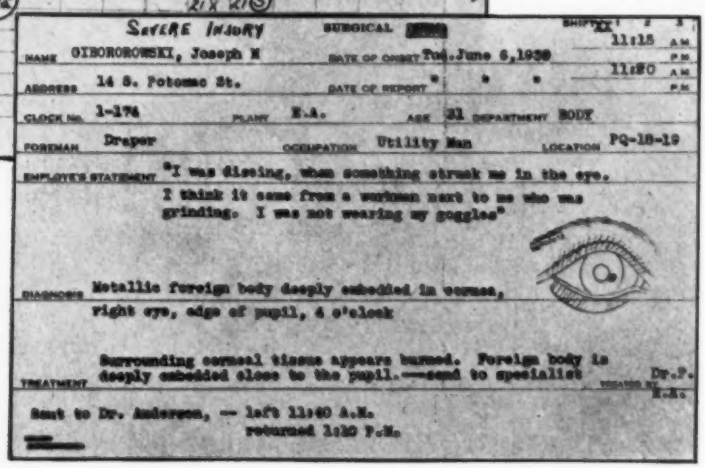

SEVERE INJURY
SURGICAL
NAME GIBOROWSKI, Joseph M
DATE OF ONSET Tue. June 6, 1939
11:15 AM
ADDRESS 14 S. Potomac St.
DATE OF REPORT
11:20 AM
CLOCK NO. 1-174
PLANT E.A.
AGE 31
DEPARTMENT BODY
FOREMAN Draper
OCCUPATION Utility Man
LOCATION PQ-18-19
EMPLOYEE'S STATEMENT "I was dicing, when something struck me in the eye.
I think it came from a workman next to me who was grinding. I was not wearing my goggles"
DIAGNOSIS Metallic foreign body deeply embedded in cornea, right eye, edge of pupil, 4 o'clock
TREATMENT Surrounding corneal tissue appears burned. Foreign body is deeply embedded close to the pupil.---send to specialist
Dr. P.
Sent to Dr. Anderson, — left 11:40 A.M.
returned 1:10 P.M.

Fig. 20.

The foregoing conclusions and observations add up to this—environment, occupation, physical condition, etc., play the *minor* role in the incidence of injury and physical complaints during working time. The *major* role is played by what we term "the human factor." A safe and an unsafe worker retain the same status regardless of environment and occupation. We do not intend to convey the idea that the status *never* changes. It does. We do, however, point out that, with extremely few exceptions, the status of those individuals who make up our basic 30% group never changes so long as they are left *to their own devices*. When a change for the better does occur, the reason can almost always be traced to *some personal attention paid directly to the individual.*

In this analysis of *minor* sick

CHRONOLOGICAL ENTERING OF EVENTS ON THE INDEX CARD

COLUMN NUMBER	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
SURGICAL									INDEX RECORD OF PLANT HOSPITAL SERVICE					MEDICAL		
				Feb	13	23		Apr	1942	Jan	15 Rx	Feb			28	Apr
3		19	22		Jun	7				11			30	Jun		25 RL A
				Feb	4	19	26		1943	Jan	25 Rx	29				
			Apr	13	15	19			Mar	10	12	Apr			19	20 S
	30	July	12	23					22					Aug	10	

When both Surgical and Medical entries are made the name of the month appears in the same column section on both sides. Note - (1942) February, April and June - appear in columns 4, 8, and 6, respectively on both sides.

When only Surgical entries are made within any one month, the name of that month does not appear on the Medical side and vice versa - note (1943) - the absence of January and March on the Surgical side - and February on the Medical side.

Entries are made in actual sequence on both sides. Note - (1943) the two blank sections in columns 5 and 6 after April on the Medical side that allow for or designate the entries of April 13th and 15th, on the Surgical side, in the corresponding columns (sections). Also note, the blank sections in columns 8 and 1, after April on the Surgical side allowing for the entries of April 20th and 22nd on the Medical side, in the corresponding columns (sections).

This method of entry establishes any relation between the incidence of injury and medical complaints, etc. It is of value in presenting a graphic picture of the individual. Correlation between the index record and sick absence record is important.

Specific Fingers - Toes - Ribs - Organs, etc., are indicated only when injury is classified as SEVERE.

Specific Fingers, Ribs, etc., are designated by ROMAN NUMERALS

EXAMPLES:

COMPOUND FRACTURE of the Left Third Metacarpal Bone

FRACTURE of the Right Great Toe

PUNCTURE WOUND of the Right Lung

FRACTURE of the Right Fourth Rib

FRACTURE of the Left - Sixth - Thoracic (dorsal) Vertebra

Fig. 18-4.

absenteeism (Fig. 36-A, p. 23) we again see a fairly constant minority producing the bulk; 68.24% is produced by but a fraction less than 20% of the employees. The general truths, conclusions and observations concerning *minor* sick absenteeism conform closely to those concerning accidental injury and medical complaints.

Some comfort may be derived from these conclusions in the realization that at least 70% of our industrial family is composed of good, average, safe and relatively healthy American citizens. I repeat again what I said of them in 1938: "This 70% constitutes the very backbone of industry and the future welfare of the nation. Within this group lie the important collective problems and their solutions." All too frequently the ills generated by a minority become a time-monopolizing major problem, causing the everyday ailments, education and care of the dependable majority to become obscured and neglected. This emphasizes the final point that we made when discussing adequate medical personnel, and illustrates this statement, "an industrial medical department, manned only to take care of direct dispensary service, is at best realizing but 40% of its potential value to industry." Our safety, personnel and medical departments should be sufficiently manned to do more for our depend-

SURGICAL	INDEX RECORD OF PLANT HOSPITAL SERVICE	MEDICAL
Nov. 11—		1936 Sep. 30 Rx Dec. 23
Feb. 8—		1937 Mar. 3 1/4 Oct. 4 Rx
Jan. 11 IV x Mar. 2 2c/2a 9 2c/2a 10 2/2 31 2c/5 April		1938 Mar. 8 1/4 27 1/6 30 2/3 April
6 2-/2a 8— 12 5/5 16— 23— May 18 3— 19 3/3		7 1/4 9 1/4 13 1/5 May 7 Rx 7 S
June 8 5/5 July 2 1-/4 12— 13 1/1 Aug. 30 1-/5		
31— Sep. 3 3b x/1 7 4c/1 Oct. 8— 15 3/3 18— x		Oct. 9 1/4 14 1/4
21 5/5 28— Nov. 3 3d x/4 5 3c/4 9— x 12— Dec.		30 2/3 Nov. 7 1/4 SM 15 1/5 26 DR Dec.
6 1/1 8— 20 1-x/1 29—		10 4/1 12 VC/1
Jan. 12— 16— 18 1-/8 19 3a x/4 Feb. 2— 8—		1939
14 1/1 Mar. 1— 21 1b/1 April 11 2/2 14— May		Mar. 6 2/3 May
2 2c/2a 22 2c/2a 31 2c/2a June 5 6 2c/2a July 18 P— 19—		21 Rx 21 S July 17 4/1
30— Aug. 10 3d x/1 Oct. 13 1-/3 Nov. 10—		Aug. 4 2/3 Nov. 6 VC/1
Jan. 8 3a x/8 April 4 1d/13 July 8 5V3/4 Sept. 3 5-a/5		1940 May 16 Rx Aug. 26 2/3
Nov. 4 2/2 Dec. 26 P 1-x/5		Nov. 5 1/4 8 VC/1 Dec. 27 2/3
Feb. 6 1/1		1941 May 8 Rx Nov. 18 VC/1
Jan. 22— Dec. 17—		1942 April 15 Rx
NAME LAST [illegible],	FIRST Joseph	MIDDLE Melvin	SOCIAL SECURITY NO. [illegible]	DATE FIRST EMPLOYED Oct. 1, 1936

Fig. 21.

ABSENT REPORT

Clock No. 1-174
Name Joseph M. Giborowski
If Clock Card has been withdrawn.
Report to Personnel
Bring this card with you.

REASON FOR ABSENCE
Plant Injury ☐ Sickness or Outside Injury X
No Work ☐ Excused ☐ Unknown ☐

HOW REPORTED
Phone ☐ Letter ☐ Foreman ☐ Other Employe ☐
Time A.M. P.M. Date
Signed

MEDICAL DEPARTMENT REPORT
This employe is unable to work ☐ (DATE)
This employe is able to work 11-26-38 (DATE)
Medical Department
By Wm. J. Faulkner M.D.

PERIOD OF ABSENCE
Off From 10-40 A.M. P.M. Date 11/15/38
Returned 7-30 A.M. P.M. Date 11/26/38
Timekeeper

EMPLOYE'S STATEMENT
Employe's statement of the reason for his absence as recorded hereon.
Sent home by plant dispensary. Acute tonsilitis
Employe's Signature

RECORD OF ABSENCE DUE TO ANY PHYSICAL DISABILITY — MEDICAL DEPT. FILE

NAME Joseph M. GIBORORWSKI

		Loss of Time: Calendar Days	Work Days
1937			
Tu. Feb. 16 - Fr 2/12 "Bad Cold" - home treatment	WJF	4	3
Mo. Mar. 15 - Th 3/4 LaGrippe c Bronchitis. Note from Dr. C.L.Brown	Y	12	8
Thu. Oct 14 - of M 10/11 "Sore throat". home treatment.	M.A.	3	3
Sat. Nov 20 - of W 11/10 Streptococic throat. Note from Dr. C.L Brown in file Metropolitan Blank	M.A	10	7
1938			
M. Mar. 28 - Fr 3/11 (sent home from plant) LaGrippe c Acute Bronchitis note from Dr. C.L. Brown in file. Metropolitan Blank —	M.A.	17	12
Fr. Apr. 22 - Su. 4/17 "Bad Cold" - home treatment T-98.6	Y	5	3
Thu. Oct 27 - Su. 10/23 "Tonsilitis" No treatment.	Y	4	2
Sa. Nov. 26 - Tu 11/15 Sent home from plant. Peritonsilar Abscess. note from Dr. C.L.Brown in doctor's file. Metro Blank —	W.J.F.	11	8

NAME LAST	FIRST	MIDDLE	SOCIAL SECURITY NO.	DATE FIRST EMPLOYED
GIBORORWSKI,	Joseph	Melvin	216-01-507	Oct. 1, 1936

Figs. 22 and 23.

able majority. Too often they are truly "the forgotten men."

Our individual records are now set up, some basis of measure and comparison is established, and general truths and statistical analyses have been discussed. Discussions on these general and statistical truths are numerous and of great

EA 1809

RECORD OF ABSENCE DUE TO ANY PHYSICAL DISABILITY — MEDICAL DEPT. FILE

NAME

Loss of Time: Calendar Days | Work Days

NAME LAST	FIRST	MIDDLE	SOCIAL SECURITY NO.	DATE FIRST EMPLOYED

Fig. 24.

EA 1808

RECORD OF ABSENCE DUE TO ANY PHYSICAL DISABILITY — MEDICAL DEPT. FILE

NAME Joseph M. GIBORORWSKI.

		Loss of Time: Calendar Days	Work Days
1937.			
Tu.Feb 16 - Fr 2/12 "Bad Cold" -home treatment.	WJF	4	3
Mo.Mar 15 - Th 3/4 LaGrippe c Bronchitis. Note fm Dr.C.L.Brown	Y	12	8
TR.Oct 14 - Mo 10/11 "Sore throat" home treatment	M.A	3	3
Sa.Nov.20 - W 11/10 Streptococic throat. Note from Dr. C.L Brown in file Metro. blank.	M.A	10	7
1938.			
M.Mar. 28-Fr 3/11 (Sent Home frm plant) LaGrippe c Acute Bronchitis Note frm Dr. C.L.Brown in file. Metropolitan Blank.	M.A.	17	12
Fr.Apr.22 -Su.4/17 "Bad Cold" - home treatment. T- 98.6	Y.	5	3
TH Oct. 27 - Su. 10/23 "Tonsilitis". No treatment.	Y	4	2
Sa.Nov.26 - Tu 11/15 Sent home frm plant. Peritonsilar Abscess. Note frm Dr. C.L.Brown in doctors' file. Metro. blank.	WJF	11	8
1939.			
Th.Aug.24-Mo 8/14 Tonsilectomy- Metro. Surgical Blank. (Hodrah.')	F.	10	0
1940.			
1941.			
1942.			
Tu.Jan 6-Th 1/1 Sprained Ankle."Fell on toy at home."	WJF	5	1

NAME LAST	FIRST	MIDDLE	SOCIAL SECURITY NO.	DATE FIRST EMPLOYED
GIBORORWSKI.	Joseph	Melvin -	216-01-507	Oct.1,1936

Fig. 25.

academic interest; however, doing something about them comes down to the practical. An accident or an illness in industry or anywhere else begins with one individual and ends with one individual. One human being is the mathematical unit of vital statistics. There will be no change in those statistics until something happens to alter at least one of those individual human units. We, therefore, hold that the most done for the greatest number of individuals will affect your accident and other vital statistics the most beneficially. Attention to the individual is the starting point of safety engineering toward altering the "human factor" element.

WE ARE NOW in a position to make our records live, and to apply them. The application should not be unique to a nurse, a doctor, or a clerk, but should be entered into by the combined staff. Every member of the medical department should be educated as to the whys, wherefores, and aims of every method and phase of treatment, recording or administration, and should be trained to take an active part in every one of them. Exercise of individual initiative should be encouraged, and occasional "mistakes of the head" be tolerated and charged to the acquiring of experience. There is little room in medicine for "mistakes of the heart." Let me remark here that monotony imposed on a member of the staff, by harnessing him day after day to one small phase of medical procedure, is deadly to the development of his individual enthusiasm, incentive, pride, imagination, and progress—just as deadly as monotony harnessed on the practitioner of any other art.

Let us outline the machinery of application, follow-up, and evaluation. Every visit to the dispensary affects someone's record in some way. The members of the dispensary staff making the entry on the Index or Absent Record are familiar with the basis of measure. Trained to recognize deviation from the average, or unusual departure from the past record of the individual, they are expected to act immediately on these occasions. There should always be recourse to the head nurse or other staff member with longer experience for advice and guidance. Where accidental injury is the offender, the case should be referred to the safety director. Medical complaints and sick absenteeism are initially medical problems, and are handled by the plant physician, the head nurse,

[redacted] REQUEST FOR PHYSICAL EXAMINATION

DATE _____

NAME _____

REPORT TO THE MEDICAL DEPARTMENT _____ A. M. / P. M.

DEPARTMENT _____ FOREMAN _____

RATING		HEIGHT	WEIGHT	AGE	VISION				COLOR VISION	1	2	3	4	5
PHYSICAL	WORK				GLASSES R	GLASSES L	R	L		S	C	S A		

KEYSTONE — CLASS

EXAMINER'S NOTE

_____ M. D.

Fig. 26. (Blank.)

or other staff members that they may designate. Frequently, cases turn out to be distinctly personnel problems. Lastly, some may become the problem of superintendent or higher management.

In Fig. 37 we find a nurse entering a new accidental injury, in code, on the Surgical side of an employee's Index Record on September 1. Let us take a look at this record (Fig. 38). We will call it case "A." This employee was examined for employment on August 27 and has worked only three and one-half days, yet already has suffered three accidental injuries and registered one medical complaint. This is way above standard. Here is an early indication of some deficiency in this new employee. It is distinctly a case for the director of safety. The nurse immediately sees to it that the Index Record, together with any pertinent observations and remarks, is transcribed on the form shown in Fig. 39-B, p. 24. To this is attached a 3 x 5 Personal Contact record card —(also shown in Fig. 39-B)— stamped with the word, Safety. Both are forwarded to the director of safety. The nurse enters the code symbol on this employee's Index Record to indicate this Personal Contact. After the safety director makes whatever investigation or contact he deems necessary, he records his findings and action on the Personal Contact card, and returns it to the hospital file (Fig. 39-A). This is the record of the entire transaction — including the notes by the safety department and the request for follow-up in 30 days. I should like to call attention to the sentence appearing on the transcribed form: "An investiga-

[redacted] REQUEST FOR PHYSICAL EXAMINATION

DATE May 21, 1939

NAME JOSEPH M. GIBOROROWSKI

REPORT TO THE MEDICAL DEPARTMENT 10:00 A. M. / P. M.

Periodic Examination

DEPARTMENT Body Shop FOREMAN Draper

RATING		HEIGHT	WEIGHT	AGE	VISION				COLOR VISION	1	2	3	4	5
PHYSICAL	WORK				GLASSES R	GLASSES L	R	L		S	C	S A		
A	M	67	148	28	25	28				V BA	AA	A		

KEYSTONE — CLASS B

EXAMINER'S NOTE Condition improved over 5/7/38. Medical complaints and sick absenteeism markedly less. Safety record remains bad. Safety director and foreman consulted.

Left handed individual

Wm. J. Fulton M. D.

Fig. 26. (Filled In.)

tion of the habits, operation, surroundings and working associates of this employee may point the way to an improvement in safety, health and efficiency." You will note that investigation by the safety department located the underlying cause of these accidents—"horseplay" — and corrective measures are being taken. The date for follow-up of case is set and noted on the hospital calendar. When the follow-up date is reached, a glance at the individual's record will serve to measure the effect by comparing the recorded items after the date of the personal contact with those before. This appraisal will determine what future action may be necessary. When the appraisal indicates that definite improvement has taken place, you are faced with the most important follow-up of all, namely, *to call the individual in and tell him about it.* I know of no maneuver that better promotes morale and, if omitted, creates a more subtly damaging psychological effect. This same routine of find-the-case, action, record, follow-up,

Joseph M. Giborowski
EMPLOYEE'S SIGNATURE

PHYSICAL EXAMINATION RECORD — MEDICAL DEPT.
EASTERN AIRCRAFT — BALTIMORE DIVISION
GENERAL MOTORS CORPORATION

DATE EXAMINED	RATING PHYSICAL	RATING WORK	HT	WT	AGE	VISION GLASSES R	VISION GLASSES L	VISION R	VISION L	COLOR VISION	HEARING R	HEARING L	BLOOD PRES.	PHYSICAL DEFECTS MAJ.	PHYSICAL DEFECTS MIN.	1	2	3	4	5
9/30/36	A	H	67	151	25	20	20						120/80		2					
10/4/37	A	H	67	153	26	20	20						130/80		2	OS	OS	BA		
5/7/38	BA	M	67	144	27	25	25						110/70		2	BA	BA	BA		
5/21/39	A	M	67	148	28	25	28						130/80		2	BA	AA	A		
5/16/40	A	A	67	152	29	35	40						130/80		1	A	AA	AA		
5/8/41	AA	H	67	158	30	35	40	20	20				130/80			AA	OS	OS		
4/15/42	OS	H	67	160	31	30	35	20	20				130/80			OS	OS	OS		

LIST PHYSICAL DEFECTS NOTED AT FIRST EXAMINATION
~~Infected Tonsils~~ 8/14/39
~~Teeth poor~~ 5/1/41

IF SUBSEQUENTLY CORRECTED CROSS OUT AND NOTE DATE

EXAMINER'S NOTE AND SIGNATURE

General physical condition seems good. Well developed. Tonsils are quite large and appear infected. teeth need attention. Advised re tonsils and history of frequent sore throat.

9/30/36
WF-KC SIGNED BY: Wm. J. Fulton M.D

COLOR HAIR	COLOR EYES	S	M	W	D	NUMBER OF CHILDREN	RACE	WASSERMANN BLOOD TEST	LEFT-HANDED?
Brown	Gray		X			1	W	Neg 8-36 13CHO	X

NAME LAST	FIRST	MIDDLE	SOCIAL SECURITY NO	DATE FIRST EMPLOYED
GIBORORWSKI,	Joseph	Melvin	216-01-507	Oct. 1, 1936

SCARS—DEFORMITIES

PSYCHOLOGY

PERSONAL HYGIENE

URINE

RECORD BRIEFLY ONLY THE POSITIVE ANSWERS TO THE FOLLOWING QUESTIONS. NOTING THE DATE, PLACE, CONDITION AND ANATOMY

HAVE YOU EVER HAD AN OPERATION?

FRACTURED BONES?

SERIOUS ILLNESS OR INJURY? Pneumonia, March 1931 Mercy Hospital, Baltimore, Maryland

OCCUPATIONAL DISEASE?

ANY ALLERGY?

HAVE YOU ANY CHRONIC TROUBLE? sore throat often

WHAT WAS YOUR LAST OCCUPATION? Truck Driver

EXAMINERS' SUBSEQUENT NOTES WITH DATE AND SIGNATURE

Oct. 4, 1937 - General condition as of 9/30/36. Has a coryza at present. Tonsils inflammed-advised. Wearing bad working shoes - advised. Safety and medical complaint record very good. Has lost much time because of sickness. WF-KC 10/4/37

May 7, 1938 - General condition is below average. Loss of weight. Vision has declined. Safety and complaint record below average. Sick absenteeism bad - lost time due to colds and sore throat. Advsied re vaccines - to consult family physician. WF-KC Personnel Department consulted re - safety record. 5/7/38

over

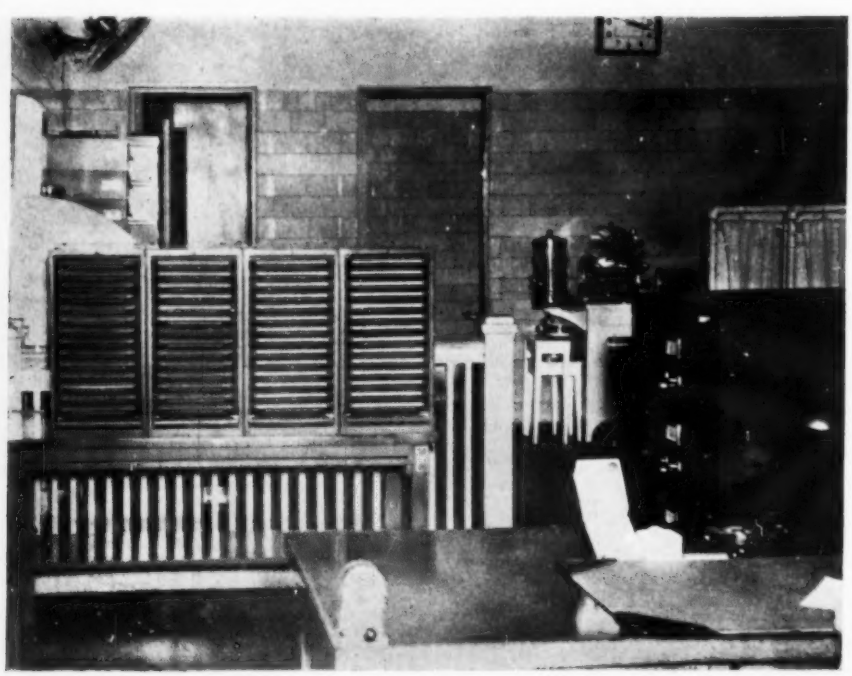


Fig. 28.

Fig. 27.

measure, and evaluate is carried out in all such personal contact cases. Time will not allow detailed discussion of all phases.

THE procedure is growing to be a case-finding agency and a method of doing something, not only in the realm of safety, health, and sick absenteeism, but in innumerable other phases of human actions and relations. Applying it strikes at the very roots of accidents and sickness. Many have been helped in one or more departments, and, following this personal effort in the individual direction, have shown steady improvement. It is the results obtained by applying such studies that put romance into the "little things" of industrial practice, so often called the "boring routine"—the tiny aches and pains, the complaints, the little cuts and bruises. I am convinced that the

SUBSEQUENT NOTES WITH DATE AND SIGNATURE

May 21, 1939 - Shows general physical improvement. Gain in weight. Feels better all over. Has had fewer colds and no lost time since taking vaccines last December. Still has some sore throats and tonsils are injected. Advised to have tonsils removed this lay-off if possible, and to have dental work done. Safety record still bad - foreman contacted. Too many eye injuries WF/KC 5/21/39 N.J.F.

May 16, 1940 - Steady improvement. Tonsils removed last August. No more sore throats. Gain in weight and feeling of general well being. Repeated respiratory vaccines last November - and "He believes it has done a good job". No more sick absenteeism. Safety has improved. Fewer complaints. Decline in vision noted and oculist advised - also attention called to teeth. Few abdominal complaints recently - marked distension noted - advised against wearing a tight belt - (probable cause) N.J.F. 5/14/40

May 8, 1941 - General condition well above average. Safety, complaint, and sick absent record outstanding. (Personnel record shows marked improvement) Teeth have been repaired. Vision corrected to 20/20. Wearing proper working shoes. Continues to take vaccines each fall. No important physical defects noted. N.J.F. 5/8/41

April 15, 1942 - General condition in all respects seems outstanding. Brings in report from family physician. Wassermann 1/12/42 - Negative. Primary vision shows slight improvement. X-ray of Thorax "Few calcified glands - no evidence of any active pathology". Tuberculin test negative. N.J.F. 4/15/42

RATING SYMBOLS FOR GENERAL PHYSICAL CONDITION, SAFETY, COMPLAINTS, AND SICK ABSENTEEISM		SYMBOLS TO DENOTE THE TYPE OF WORK FOR WHICH THE EMPLOYEE IS PHYSICALLY QUALIFIED	
O.S.	- OUTSTANDING	H.	- HEAVY - ARDUOUS WORK
A.A.	- ABOVE AVERAGE	A.	- AVERAGE WORK
A.	- AVERAGE	M.	- MEDIUM - MODERATE WORK
A-	- BARELY AVERAGE	L.	- LIGHT WORK
B.A.	- BELOW AVERAGE		
V.B.A.	- BAD		

Fig. 27.

greatest loss of industrial manpower arises right in these little things and that it is right here that the greatest opportunity for prevention exists. Here lie the histopathology, the embryology, the apostate cells, the microscopic view of accidents and disease. Do a good job here and the events of crash car sirens, operating tables and prolonged illnesses may well never occur. We might almost call it "preventive rehabilitation."

While a bit out of our industrial line, I sometimes wonder what a similar system would accomplish if applied to automobile drivers? Some permanent emblem displayed on the vehicle to identify the driver, backed by an index record of the minor indiscretions of each driver noted by alert traffic officers? I mean by *minor*, those many thoughtless and seemingly selfish acts, like the fellows who crowd forward on the left of the center of the road just to get ahead, and succeed in snarling traffic and tempers when the railroad safety gates finally go up and release the two-way jam; like the double parkers when there is ample curb space in sight; the drivers who feint to the left when a right turn is contemplated and vice versa. We could mention many others. I'll wager a 75-ration-point dinner to a peanut that a two-year analysis of such a record will agree with our basic conclusions and that a majority of the major and fatal accidents occurring within that period will involve one or more of the "thirty percenters." The wager is based on my awareness that a fair number of my 30% group in industry have lost time because of injuries received in traffic accidents.

Let me here emphasize that records such as these should be used as an instrument of education and prevention, and *never as a disciplinary bludgeon.*

We present Case "B" (Fig. 40) for three purposes: first, to show graphically the appearance of an *average record*, made during each

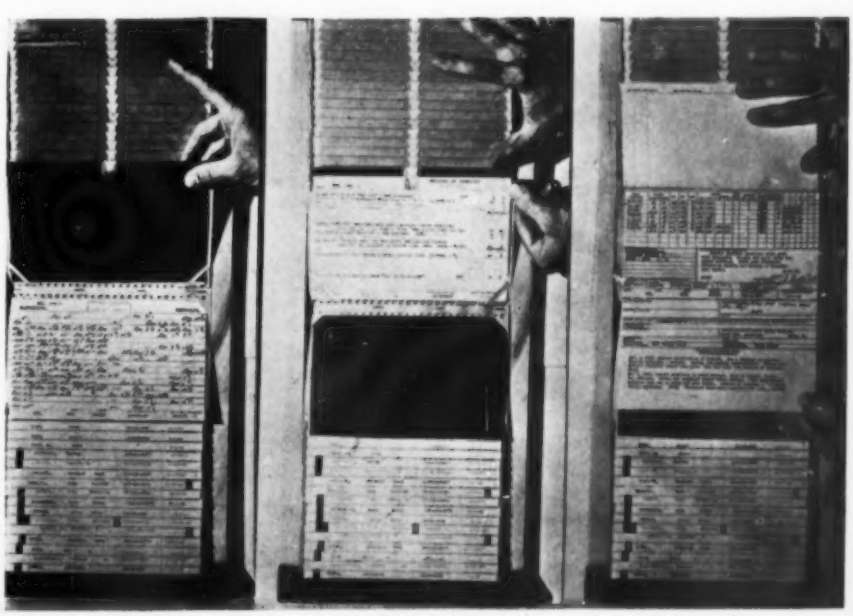
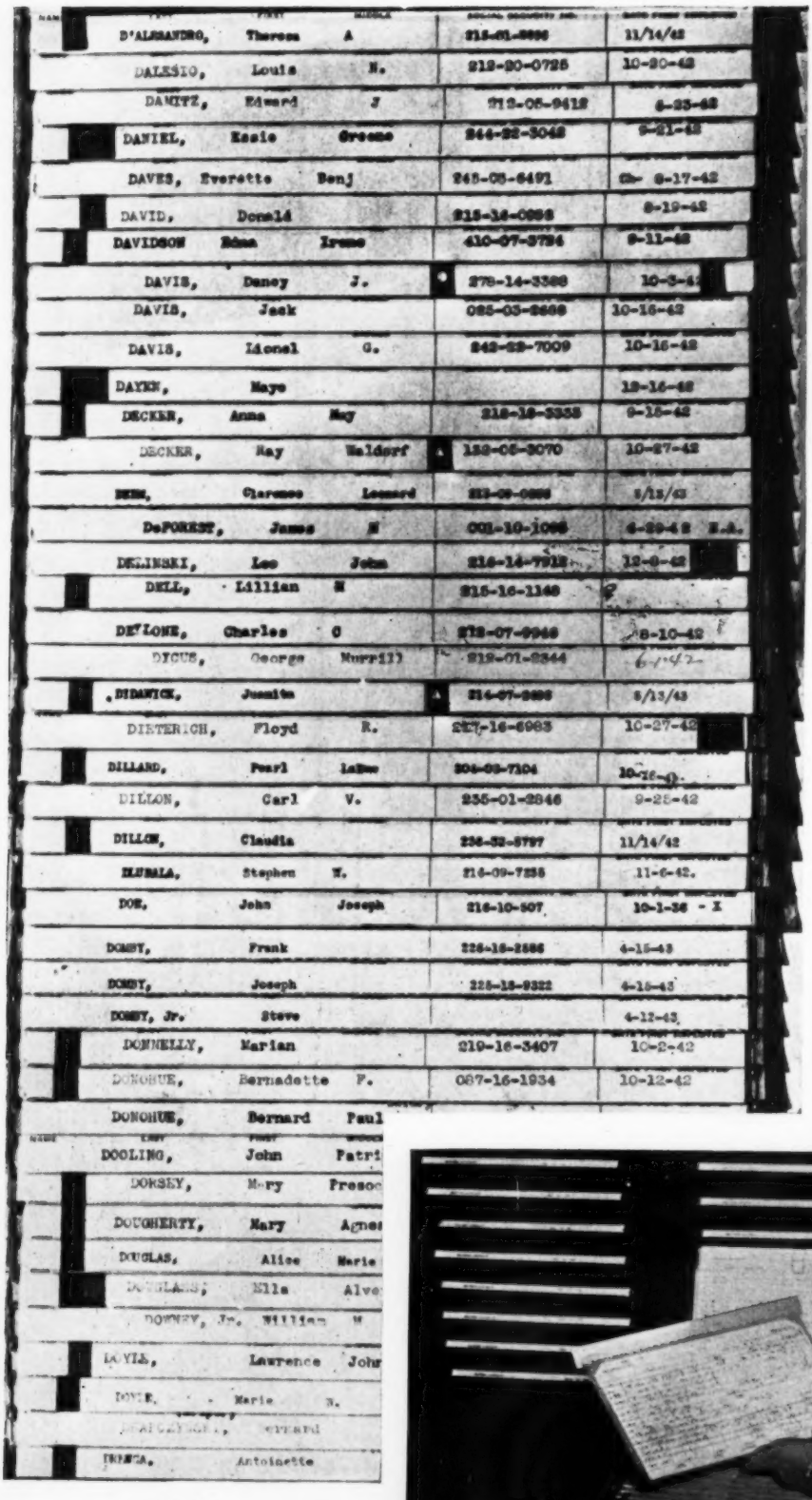


Fig. 29.



D'ALESSANDRO,	Theresa	A	215-01-8896	11/14/42
DALESIO,	Louis	N.	212-20-0725	10-20-42
DAMITZ,	Edward	J	212-05-9412	8-23-42
DANIEL,	Essie	Greene	244-22-3042	9-21-42
DAVES,	Everette	Benj	245-05-8491	8-17-42
DAVID,	Donald		215-16-0098	8-19-42
DAVIDSON	Edna	Irene	410-07-3784	9-11-42
DAVIS,	Daney	J.	278-14-3388	10-3-42
DAVIS,	Jack		025-03-2606	10-16-42
DAVIS,	Lionel	G.	242-22-7009	10-16-42
DAYEN,	Maye			12-16-42
DECKER,	Anna	May	216-18-3358	9-15-42
DECKER,	May	Waldorf	132-05-3070	10-27-42
DEEM,	Clarence	Leonard	213-09-0809	8/13/43
DeFOREST,	James	H	001-10-1088	6-29-42 R.A.
DELINSKI,	Leo	John	216-14-7912	12-8-42
DELL,	Lillian	M	215-16-1148	
DE LONE,	Charles	C	212-07-9948	8-10-42
DIGUS,	George	Murrill	212-01-2344	6-1-42
DIDANICK,	Jeanita		214-07-2808	8/13/43
DIETERICH,	Floyd	R.	247-16-6983	10-27-42
DILLARD,	Pearl	LaRue	304-03-7104	10-26-42
DILLON,	Carl	V.	235-01-2846	9-28-42
DILLON,	Claudia		236-32-5797	11/14/42
DUBALA,	Stephen	M.	216-09-7256	11-6-42.
DOE,	John	Joseph	216-10-507	10-1-36 - X
DOMBY,	Frank		228-16-2586	4-15-43
DOMBY,	Joseph		225-18-8322	4-15-43
DOMBY, Jr.	Steve			4-12-43
DONNELLY,	Marian		219-16-3407	10-2-42
DONOHUE,	Bernadette	F.	087-16-1934	10-12-42
DONOHUE,	Bernard	Paul		
DOOLING,	John	Patri		
DORSEY,	Mary	Presc		
DOUGHERTY,	Mary	Agnes		
DOUGLAS,	Alice	Marie		
DOUGLAS,	Ella	Alve		
DOWNEY, Jr.	William	M		
DOYLE,	Lawrence	John		
DOYLE,	Marie	R.		
[illegible],	Everett			
DRENTA,	Antoinette			

Fig. 30.

of the two years of 1941 and 1942; second, to demonstrate a departure from the average that begins in July, 1943; and, third, to illustrate the method of evaluating or measuring the effect of the personal contact therapy in behalf of the individual. All new injuries and medical complaints, with the exception of injuries involving the eyes,

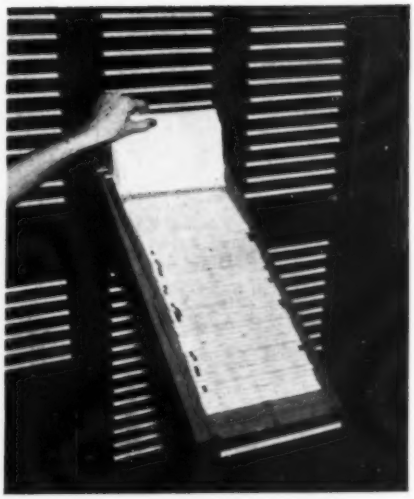


Fig. 30.

are represented by solid circles. Eye injuries are representd by circles enclosing an 'E'. It was the unusual number of injuries beginning in July that caused the sudden departure from the normal. The nurse coding the injury of July 10, noting this, set in motion the procedure outlined in our previous case. Investigation disclosed a decline in the visual acuity of this employee that probably accounted for his failure consistently to use eye protection. Correctively ground glasses were prescribed. More than 75 days have passed since the circle enclosing the "S" was entered on the medical side on July 10, to symbolize this personal contact. There are no more eye injuries. One minor injury and one medical complaint have been recorded since.

Then there is the case of John

Fig. 31-A.

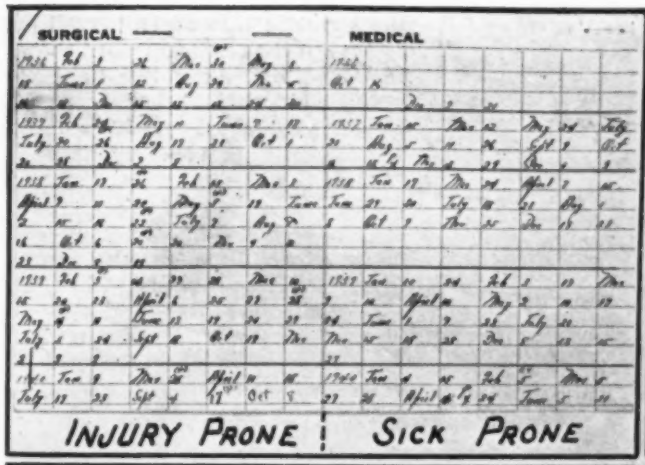
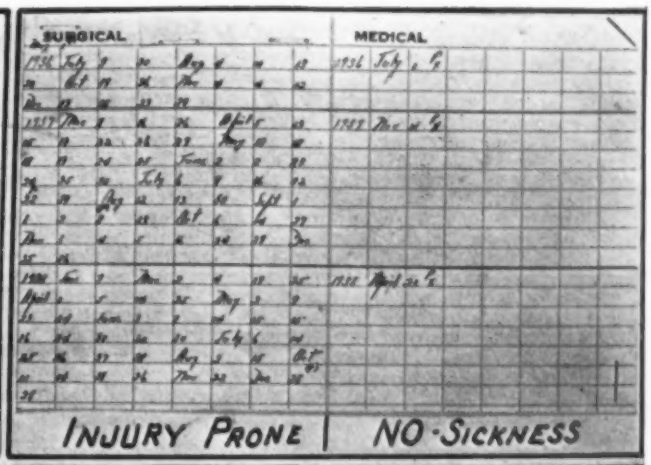
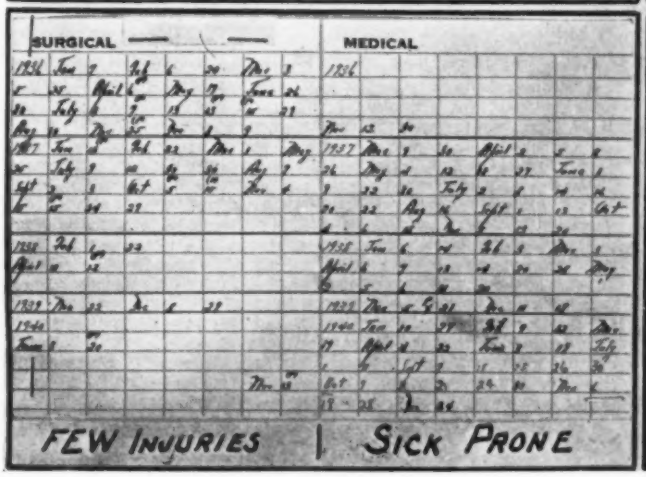


Fig. 32.





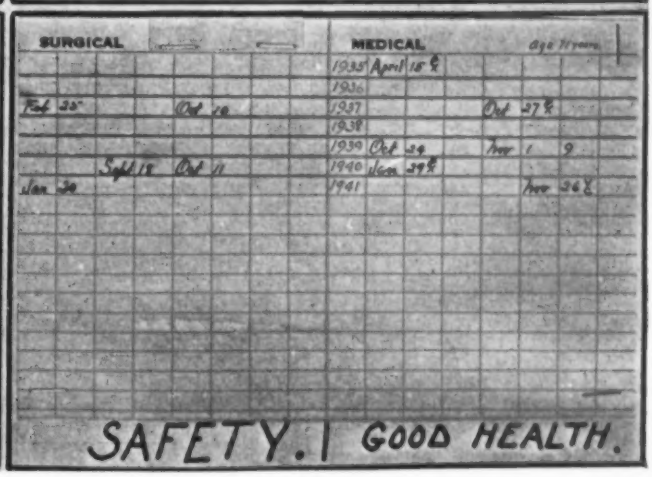


Fig. 33.

Doe (Fig. 41) who, early in the course of his employment, became a problem and continued thus. Efforts on the part of medical, safety, and personnel departments were futile. The transcribed record here shown is on the way to the supervisor of Doe's department. The safety director prophetically noted that "we will have a very serious and permanently disabling accident if something is not done about this employee." We shall never know if further efforts would have rescued

Fig. 31-B.

INDUSTRIAL DATA

REQUIRED TO ESTABLISH A STANDARD OR MEASURE

1. AVERAGE NUMBER OF EMPLOYEES WORKING, PROBABLY BROKEN DOWN INTO MEN, WOMEN, AND SHIFTS
2. MAN HOURS WORKED
3. PRODUCTION HOURS WORKED
4. NUMBER OF DAYS PLANT WAS IN OPERATION
5. NUMBER OF SHIFTS
6. MEDICAL AND COMPENSATION COSTS

Fig. 34.

YEARLY AVERAGE

DIRECT HOSPITAL SERVICE

PER EMPLOYEE PER YEAR	3 SHIFTS ROTATING 6 Day—48 Hr. Wk.		ONE SHIFT DAY ONLY 5 Day—40 Hr. Wk.
	WOMEN	MEN	ALL MEN
INJURIES	7.41	7.27	6.89
MEDICAL COMPLAINTS	8.59	5.20	4.18
SICK ABSENTEEISMS (Any Duration)	4.99	2.37	1.72
TOTAL	19.97	14.11	12.80
Combined Total		*16.46*	

Fig. 35.

this case, and must chalk it up as one of our failures. Shortly after the date on this transcript, this employee met his death in an accident outside of the plant that involved no person other than himself.

Case "C" (Fig. 42) is the last of the series in this clinic. Recall the picture of the average record shown in Case "B," filling two lines per year. This patient has been employed just short of 10 months. There are five personal contact symbols on the Medical Side. Not only do we fail in helping this case—it seems that the effort has an adverse effect. Note the accelerated rate of injuries after June 12, when the safety director was appealed to. Note the acceleration in medical complaints after the personnel director held council on July 29. This case is an example of the quality "X" in reverse. We have not yet admitted failure, but the situation appears critical.

This last case (and there are many like it) presents a poser to industry. It is generally accepted by democracy that we are created equal and endowed with certain inalienable rights. However, the falsity of the hypothesis— that we *are* alike and possess the same capacities—beggars argument. Types like our last case have been observed over a span of years. Characteristic points stand out. Transfer any number of them to a department and their presence is soon reflected in an increased number of accidental injuries in that department. Their own tempo of injury and complaint is fairly constant no matter where they work. The striking accident increase is in the injuries to heretofore safe workers with whom they are newly thrown. We possess no specific data regarding the effect on efficiency, rate of production, or morale, but our observation and innumerable (recorded) consultations with supervisors establish a definite connection. These types are our *faulty* "human tools." In the "collective pathology" of human relations they act much as carriers of infection. Sporadic and long-lasting epidemics of accidents, unrest and many other undesirable states are frequently traceable to them.

There will scarcely come a time when we shall not have faulty human tools, but this need not mean that nothing can be done about it. The educators have long since met this problem. They clearly saw that mixing below-average children with average and above-average handicapped all three classes. The lower groups could not get the best out of their limited potentialities because of the hopeless competition, while the potential progress of the higher groups was definitely retarded. Tests to spot the groups and special classes for each marked a milestone in the progress of education.

REPEATED ANALYSES OF THE INDEX RECORD OF PLANT DISPENSARY SERVICE

PERCENTAGE ACCIDENTAL INJURIES AND MEDICAL COMPLAINTS		PERCENTAGE OF TOTAL EMPLOYEES
80 to 85%	are produce by	30%
15 to 20%	are produced by	60%
0%	are produced by	10%
100%		100%

GENERAL RULES

A — THE PERCENTAGES ARE CONSTANT—
THE SAMENESS OF THE INDIVIDUALS IN THE PERCENTAGE GROUPS ARE ALMOST CONSTANT, REGARDLESS OF ENVIRONMENT

B — PHYSICAL CONDITION AS DETERMINED BY PHYSICAL EXAMINATION IS NOT A CRITERION OF PERFORMANCE

C — SAMENESS OF THE INDIVIDUALS IN THE PERCENTAGE GROUPS CLOSELY CORRESPONDS TO PERSONNEL RECORDS

THE HUMAN FACTOR PLAYS THE MAJOR ROLE IN ACCIDENT OCCURRENCE

Fig. 36.

The problem is much the same in industry. Certainly the case we have just cited is not a purely medical, or safety, or personnel problem. It is a combined problem. By now, we can see how the scope of medical records overlaps and interlaces with the safety and personnel functions, the same being true of personnel and safety records. It is this interlacing that suggests the very urgent need of some permanent machinery that will coordinate, evaluate and put to work the combined products of these three departments—a coordinator of human engineering. I am well aware of the great good attained by the various pre-employment aptitude and other tests in regard to optimum placement. The machinery I have in mind should not stop here. It would consistently follow through during the course of employment, stacking the actual recorded performance, day by day, against the prognosis, and endeavoring to meet the constantly changing circumstances in any individual's span of life. Nor should this follow-through be for the primary purpose of demonstrating our occasional successes, but rather to evaluate and profit by our many failures. Surely, among the multitudinous operations of modern industry, there are many who can be earmarked and specially supervised for various physical and psychological groups. Would we not obtain a higher efficiency from each group than we are getting now? It seems reasonable that we would. There is not the slightest doubt in my mind that safety would benefit.

MINOR SICK ABSENTEEISM
(Less than 8 days)

	PERCENTAGE OF INDIVIDUAL ABSENCES		PERCENTAGE OF TOTAL EMPLOYEES
a.	0.00%	are produced by	53.12%
b.	31.76%	are produced by	26.95%
c.	24.81%	are produced by	10.53%
d.	43.43%	are produced by	9.40%
	100.00%	are produced by	46.88%
	c + d = 68.24%	are produced by	*19.93%*

AVERAGE NUMBER OF DAYS LOST PER ABSENCE—*2.65*

Fig. 36-A.

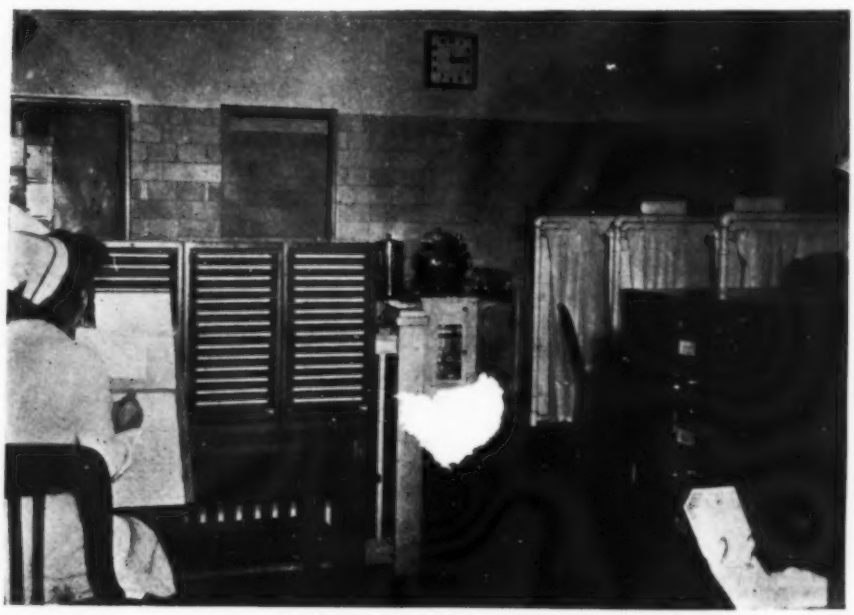


Fig. 37.

Carrying our coordination a step further, our proposed machinery can find ways and means to promote, keep alive, and provide an outlet for the imagination and creative instinct of the individual citizen. We must not allow it to be curtailed. Individual initiative and skill form our national backbone. Our present crisis found the nation with a slight curvature of the spine. We must not let it happen again. It cannot be straightened by high wages, better working environment, or social security. The underlying cause? Monotony! It is a constant challenge to us, an arch enemy of industrial social stability. It will be more deadly if our returning youngsters are left to its devices.

What has this got to do with safety?

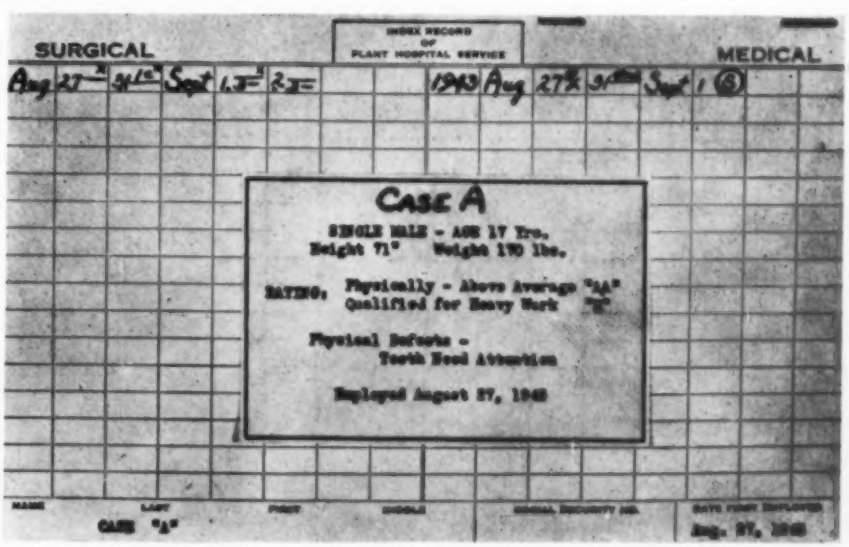


Fig. 38.

NAME Case " A " NUMBER 00-0000 DATE 9/1/43

TO DIRECTOR of SAFETY

The MEDICAL DEPARTMENT calls your attention to the following facts concerning the above named employee.

Since Aug. 27, 1943 has been treated for (3) NEW INJURIES. The dates of the visits are as follows:

Aug 27 — 31 / Sept 1 —

7 to 10 per YEAR is an AVERAGE Record

Since Aug. 27, 1943 has been treated for 1 MEDICAL COMPLAINTS. The dates of the visits are as follows:

1943 Aug 31

5 to 7 per YEAR is an AVERAGE Record

An investigation of the habits, operation, surroundings and working associates of this employee may point the way to an improvement in Safety, Health and Efficiency.

REMARKS: This man was hired on August 27th, and during four working days has visited the Dispensary three times -- please watch his operations and let us have a report. Personal Contact card attached.

PERSONAL CONTACT SAFETY
MEDICAL AND SAFETY DEPARTMENTS

NAME Case " A " DATE 9/3/43 A.M. P.M.

CLOCK No. 00-0000 PLANT B.A.

This man was observed 9/2 and 9/3 - for approximately 80 minutes. Both times he was guilty of "Horse Play" -- and failure to wear eye protection.
We are taking corrective measures.
Please check within 30 days and give us a report.
Thank you

Palmer Yale
DIRECTOR of SAFETY
by: H. to Sanders

Fig. 39-A.

Lick *monotony* and one of the most malignant of all national safety hazards wil be removed—the mental hazard.

One more point before we leave the individual. The medical staff is frequently called on for prompt decisions—decisions that frequently affect the very livelihood of many of your patients. It is a responsibility that should humble you, and we should build every safeguard lest it be abused. Complete, readily available records of each individual will insure the thoroughness, medical soundness, and justice of your decisions.

NOW WE leave the individual and go into the collective study of accidents. In so doing, we hope to demonstrate that industrial medical records, applied cooperatively, serve to further safety and act as its guide and measure. What we have to say here deals specifically with accidental physical injury, but bear in mind that such studies are likewise applicable to all phases of industrial hygiene.

NAME NUMBER DATE

TO

The MEDICAL DEPARTMENT calls your attention to the following facts concerning the above named employee.

Since has been treated for NEW INJURIES. The dates of the visits are as follows:

7 to 10 per YEAR is an AVERAGE Record

Since has been treated for MEDICAL COMPLAINTS. The dates of the visits are as follows:

5 to 7 per YEAR is an AVERAGE Record

An investigation of the habits, operation, surroundings and working associates of this employee may point the way to an improvement in Safety, Health and Efficiency.

REMARKS:

SA 201

PERSONAL CONTACT
MEDICAL AND SAFETY DEPARTMENTS

NAME DATE A.M. P.M.

CLOCK No. PLANT

Fig. 39-B.

Let us take a bit of that "one minute and 10 seconds" to extract some data of practical value from the record of each new accidental injury before we relegate it to vast and inaccessible permanent files. Kept hanging near the surgical treatment booths in the dispensary is a simple mimeographed form that we call the Medical Log (Fig.

43-A). A clean sheet is begun each shift. Immediately following the care and recording of a new injury on the surgical card, this data is transferred to the Medical Log by means of pencil marks. The entry requires but a few seconds. In Fig. 43-B we see a nurse entering a new injury on this form. In Figs. 44-A and 44-B, we take our original surgical record card of the severe eye injury originally presented in Fig. 9, and enter it on the Medical Log Sheet. The patient had begun work at 7:30 A.M., which places the injury in the fourth hour of work. A small pencil mark is made in that hour. It is an embedded foreign body in the cornea—a pencil mark is made under that heading. The patient was not wearing goggles in a zone where it is mandatory. A last mark is made under "careless."

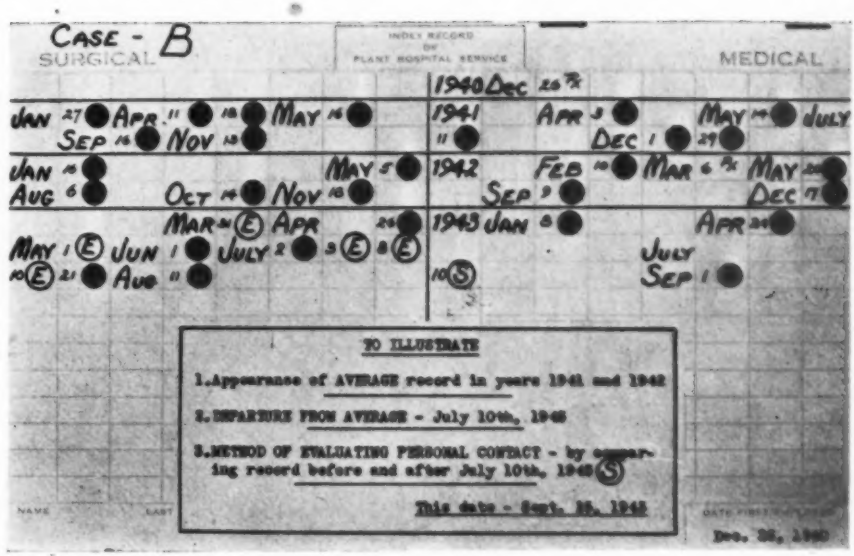

CASE - B
SURGICAL
MEDICAL
INDEX RECORD OF PLANT HOSPITAL SERVICE
TO ILLUSTRATE
1. Appearance of AVERAGE record in years 1941 and 1942
2. DEPARTURE FROM AVERAGE - July 10th, 1942
3. METHOD OF EVALUATING PERSONAL CONTACT - by comparing record before and after July 10th, 1942
This date - Sept. 25, 1942
NAME
LAST

Fig. 40.

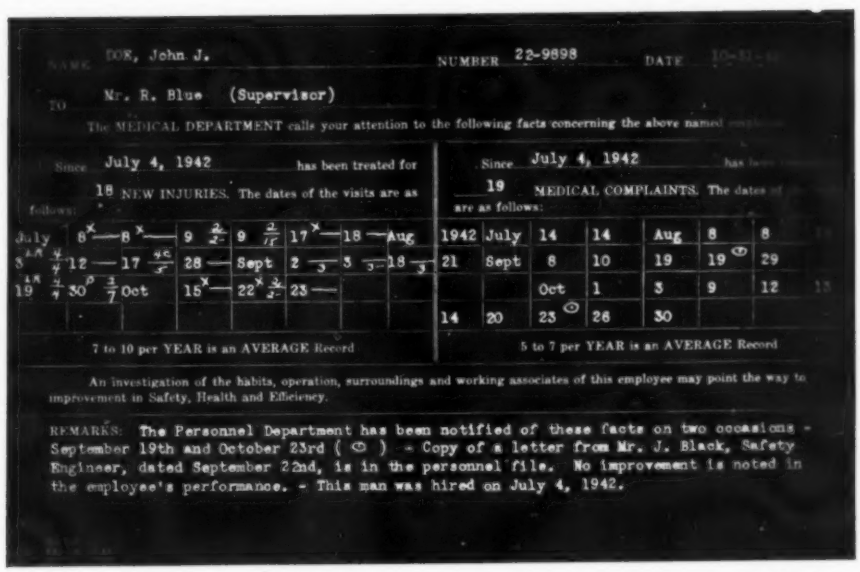

DOE, John J.
NUMBER 22-9898
DATE
Mr. R. Blue (Supervisor)
The MEDICAL DEPARTMENT calls your attention to the following facts concerning the above named
Since July 4, 1942 has been treated for
18 NEW INJURIES. The dates of the visits are as follows:
July 8 8 9 9 17 18 Aug
8 12 17 28 Sept 2 3 3 18
19 30 Oct 15 22 23
7 to 10 per YEAR is an AVERAGE Record
Since July 4, 1942 has
19 MEDICAL COMPLAINTS. The dates of are as follows:
1942 July 14 14 Aug 8 8
21 Sept 8 10 19 19 29
Oct 1 3 9 12
14 20 23 26 30
5 to 7 per YEAR is an AVERAGE Record
An investigation of the habits, operation, surroundings and working associates of this employee may point the way to improvement in Safety, Health and Efficiency.
REMARKS: The Personnel Department has been notified of these facts on two occasions - September 19th and October 23rd ( ) - Copy of a letter from Mr. J. Black, Safety Engineer, dated September 22nd, is in the personnel file. No improvement is noted in the employee's performance. - This man was hired on July 4, 1942.

Fig. 41.

Since this particular injury was deemed severe, an "S" is superimposed over each of the little pencil marks in the three headings under which this case was entered. In Fig. 45-A is the completed Log Sheet at the end of the first shift on June 6, 1939. This Log Record is at all times accessible to the safety staff, and places in their hands an ever-present mint of material that automatically serves as an instrument to direct numerous attacks at the source of accidents. In Fig. 45-C we find our director of safety making one of his frequent daily inspections of the Medical Log and singling out for immediate attention (close-up in Fig. 45-B) the unusual number of eye injuries that have occurred on this particular shift. Observing a rise in any type of injury through this simple process, the safety director can refer to the Accident Prevention file, spot the individuals and locations immediately, and put control measures in motion without undue delay. This type of accessible cooperative record also saves much time that would otherwise be required of medical and safety personnel to make many individual queries and investigations. It has one more point worthy of note, namely, it takes from other than professional personnel the necessity or excuse for general access to medical records that are properly accepted as being confidential.

At the end of the day or shift, the pencil marks on our Medical Log are totalled and can be permanently recorded on a form like Fig. 46, p. 29. Here we build the material for research too comprehensive to discuss in detail. The weather reports, absenteeism, and many other items may be correlated with it. Here, hour by hour, is the bedside accident chart of our collective patient, the barometer of injury, and the hidden answer to many unsolved problems.

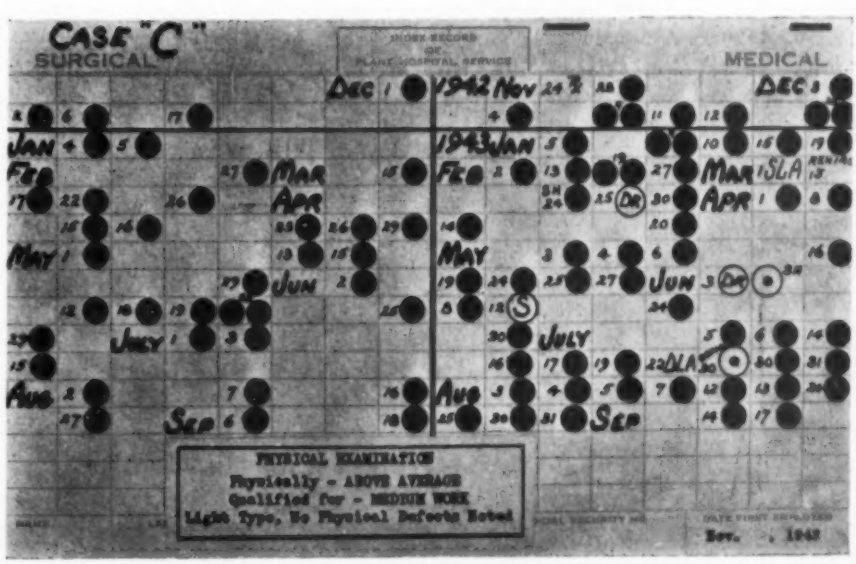


Fig. 42.

BALTIMORE MEDICAL LOG

DATE:

SHIFT:

HOUR OF OCCURRENCE

1	2	3	4	5	6	7	8	9	10	?

LACERATION | ABRASION | CONTUSION

PUNCTURE WOUNDS: NO Foreign Body | WITH Foreign Body

BURN: Thermal

FRACTURE | DISLOCATION | AMPUTATION

EVULSION | STRAIN

INFECTION | MUSCLE FATIGUE

SPRAIN

IRRITATION: Chemical | Mechanical

DERMATITIS

SPECIAL CASES

CARELESS

FAULT OF ANOTHER

SEVERE INJURY
Designate
$ = SEVERE

EYE

FLOATING FOREIGN BODY

EMBEDDED FOREIGN BODY CORNEA

CORNEA | LID | EYE-BALL

PUNCTURE WOUND

BURN

LACERATION

ABRASION

CONTUSION

CHEMICAL IRRITATION
Specify -

FLASH BURN

TOTAL -

CORNEA -

RECORD ON OPPOSITE SIDE ANY OBSERVATION OR OCCURRENCE THAT SEEMS WORTHY OF NOTE.

Fig. 43-A.

Fig. 47 is just one study, made on our recording of accidents by their "Hours of Occurrence." In this figure we have a record of the hours of occurrence for three separate months. The total for each month is shown on the bottom line. A cursory glance reveals nothing but a mass of similar figures. One living with these figures notes quickly the change from the usual. There are marked differences here —the graph demonstrates them. "A" is the usual; the syndrome of fatigue is apparent, the drop in the fifth hour occasioned by the usual lunch period. In "B," the plant was shut down for a 12-minute rest period between the second and third hours. In "C," sufficient utility and relief men insured to every employee a "staggered" six-minute rest period in the pre-lunch and after-lunch hours. There was no plant shut-down. It was proved that the change in these curves was due to these alterations in rest periods and the additional relief men. The change in the volume of our shaded graph is plain; the change in the pitch (dotted line) cannot be missed. A partial cure for fatigue finds itself. This demonstrates that the bedside chart of our collective patient is sensitive to many things, and that cause and effect can often be traced to numbers of different factors.

THE final portion of our one minute and 10 seconds is spent on the entry made on the Anatomical Distribution of Injury form (Fig. 48). It measures 17 in. x 11 in. At the end of the day the Surgical cards are entered with small pencil marks. This can be done quite rapidly. In the far right column, under "Embedded Foreign Body—Cornea," appears the "S" symbol that represents the entering of our now familiar Severe Eye Injury card. This form serves as a cross study of types of injury (horizontal columns) with anatomy (perpendicular columns). Each month, or at any other desired period, the pencil marks are added and the totals recorded. By dividing the total of any column into the grand total of injuries, we may get a Ratio Index for each horizontal or perpendicular item. A year or more of such a study establishes a standard for each type of injury or anatomical part. We have learned from long observation of this Ratio Index that certain types of injuries, like many diseases, are epidemic and that seasonal variations are almost con-

Fig. 43-B.

stant. The same is true of injuries to certain parts of the body. This type of study is of more than academic interest. It is capable of numerous practical applications, and is an instrument that indicates the optimum time to "bear down" if you would prevent a recurrence of undesirable past experiences. One instance is worth relating. Some years ago, for three successive summers, a certain department heralded the advent of warm weather with a rise, way above the standard ratio index, of injuries involving shoulders, arms, thighs, knees and legs. The cause of this rise was attributed to the rolling up of pants or working in shorts and undershirts. At the beginning of the fourth summer, management acted in response to a medical bulletin that warned of a repetition. Certain rugged individualists objected to a seeming infringement on their "right of attire" and their representatives took up the cudgel. Management and representatives appealed to the medical department for facts to back up the bulletin. They got 'em. The resulting unanimous action that summer, and in two summers past since then, has altered our past experience in this particular item most favorably.

Eye injuries should be watched with unflagging attention. In this regard, we call attention to the special Cornea Ratio at the bottom of the eye column (Fig. 48). When the ratio of injuries involving the cornea to the total of all types of eye injury (including corneal) gets lower than 1 to 18, it is a certain indication that something is wrong with eye protective enforcement or that undetected eye hazards are abroad. You can expect a "permanent partial loss of vision" to put in an appearance at your dispensary at any moment as long as this condition is allowed to exist.

Let us emphasize the mandatory importance of prompt treatment to every injury by calling your attention to the two infections in the finger column, traced to the late reports, six of which are lacerations to fingers. Keep track of your late reports. Years ago we had lots of them; that accounted for the vast majority of infections. Both were reduced to a minimum and have remained there by virtue of the procedure introduced then and since followed. Every late report of any injury that *breaks the skin* is immediately forwarded to personnel and safety departments. A personal contact follows.

The Anatomical Distribution record is, like the Medical Log, accessible to the director of safety, and can be applied much the same way.

In Fig. 49, (p. 31) to demonstrate the application of the foregoing study as a measure, we present a 16-month graph of the combined Ratio Index of Foot and Toe injuries. In September, a safety shoe campaign

Fig. 44-A.

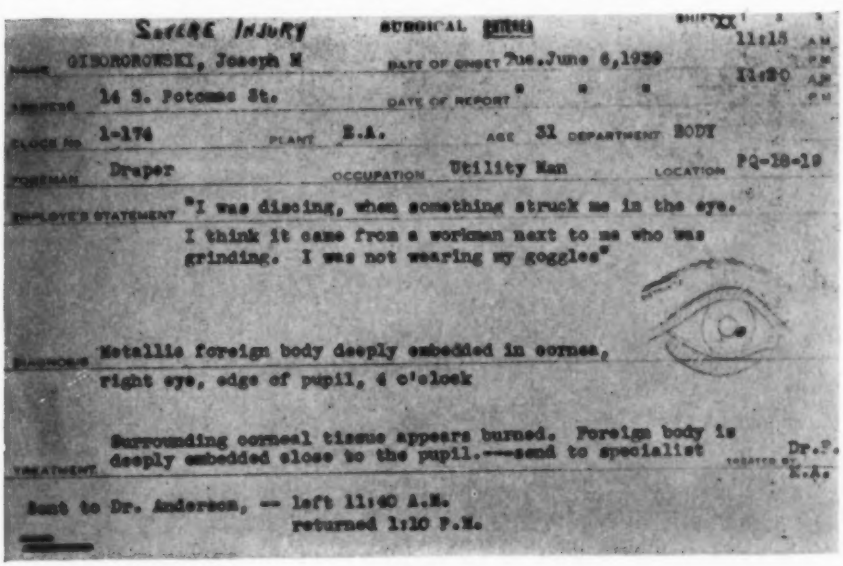

SEVERE INJURY
SURGICAL
11:15 AM
GINOROWSKI, Joseph M
DATE OF CHART Tue. June 6, 1939
11:20 AM
14 S. Potomac St.
DATE OF REPORT
1-174
PLANT E.A.
AGE 31 DEPARTMENT BODY
Draper
OCCUPATION Utility Man
LOCATION PQ-18-19
EMPLOYEE'S STATEMENT "I was discing, when something struck me in the eye.
I think it came from a workman next to me who was
grinding. I was not wearing my goggles"
Metallic foreign body deeply embedded in cornea,
right eye, edge of pupil, 4 o'clock
Surrounding corneal tissue appears burned. Foreign body is
deeply embedded close to the pupil.---send to specialist
Dr.P.
E.A.
Sent to Dr. Anderson, -- left 11:40 A.M.
returned 1:10 P.M.

Fig. 44-B.

BALTIMORE MEDICAL LOG

DATE: TUE JUN - 6 1 [illegible]

SHIFT: FIRST

HOUR OF OCCURRENCE

1	2	3	4	5	6	7	8	9	10	?
3	5	7	11	4	6	9	13	16		3

LACERATION	ABRASION	CONTUSION
33	4	2
1 LR		1 LR

EYE

FLOATING FOREIGN BODY	EMBEDDED FOREIGN BODY CORNEA
8	3

CORNEA	LID	EYE-BALL
PUNCTURE WOUND		
BURN		
LACERATION		
ABRASION		
CONTUSION 1		1

PUNCTURE WOUNDS		BURN
NO Foreign Body	WITH Foreign Body	Thermal
10	7	1
		1 LR

FRACTURE	EVULSION	INFECTION
DISLOCATION		
AMPUTATION	STRAIN	MUSCLE FATIGUE 2

SPRAIN	IRRITATION		DERMATITIS
	Chemical	Mechanical	
1		1 Blister	

CHEMICAL IRRITATION
Specify - 1 Dust 1 Grease 1 B. Acid 3

FLASH BURN

SPECIAL CASES		CARELESS 1 6
		FAULT OF ANOTHER 2

SEVERE INJURY Designate: Joseph Gutnowski # 1-174 Foreign body embedded in cornea Sent to Dr. Carlin con.

$ = SEVERE LR = Late Report

TOTAL - 15
CORNEA - 3
Cornea Under 1:5

RECORD ON OPPOSITE SIDE ANY OBSERVATION OR OCCURRENCE THAT SEEMS WORTHY OF NOTE.

Fig. 45-A.

was begun. It was pushed more vigorously and consistently by Plant No. 1, as denoted by the comparative number of safety shoes sold. The curve for Plant No. 1 shows a marked drop and continues to stay well below the former level. There is little change noted in Plant No. 2. Thus we measure and evaluate a safety campaign.

As a basis of measure for frequency of accidents, we use the man hour (Fig. 50, p. 31). It is a universal unit of time in practically all industry. The total number of new compensable accidents reported to the dispensary, divided into the the number of man hours worked, is, we believe, the simplest and most easily understood expression of frequency.

We deem an injury severe if it reduces the efficiency of the patient 50% or more for any period over four hours. We express severity by the factor resulting from dividing the number of injuries we deem severe into the total number of new compensable injuries. This measure has been watched over a period of years and proves to be an accurate and valuable measure and prognosticator. It is a simple measure and easily understood by management.

What is done when our measure spots a rise in any particular type of injury? We know from past experience that if something is not done, severe injuries soon occur. Let us use eye injuries as an example. A sudden rise in the frequency or severity is noted. The last hundred Passes to the Hospital, filed under Eye Injuries, are taken from the file and, beginning with the remote date, they are rapidly plotted on the factory map with tacks. Fig. 51 (p. 32) is an actual example of such a survey. No time-consuming plant inspection by safety committees is necessary. Two closely grouped tack areas disclose and eliminate the hazards responsible for the epidemic. One is a recently installed and badly guarded bench grinder; the other, an improperly protected exhaust vent from an air-

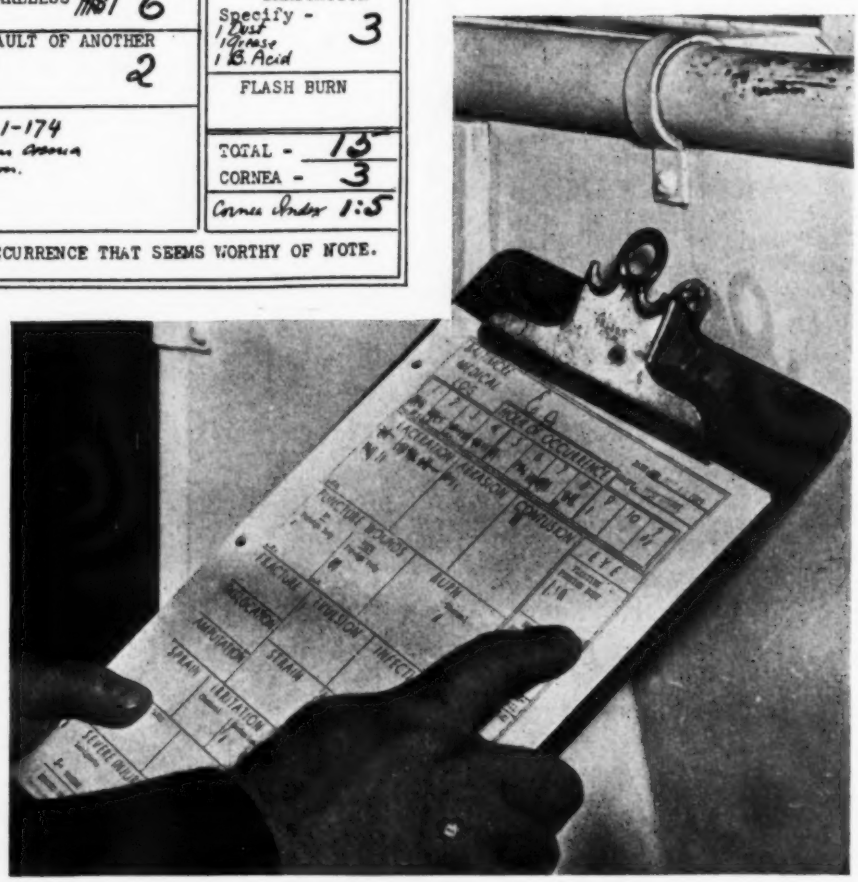


Fig. 45-B.

driven tool. These two epidemic areas are enclosed in a circle in the figure (Fig. 54). We give a close-up view of these two areas to point out the advantages of using *numbered* tacks to plot injuries in their numerical sequence of occurrence. These 15 injuries occurred within the last 24 of the 100 that were plotted. Seven of these 15 injuries involved the cornea. This method of plotting will give you a great advantage by determining the rate of concentration, the distribution, and the point and time of highest occurrence. The value of photographing these surveys for future reference and comparison should not be overlooked. Frequent unscheduled consultations relative to individual and collective safety take place between medical and safety directors. In Fig. 52 they are shown in one of their collaborative huddles.

Thus we begin and end our study of accidents with the little pass to the Hospital. It is the Alpha and

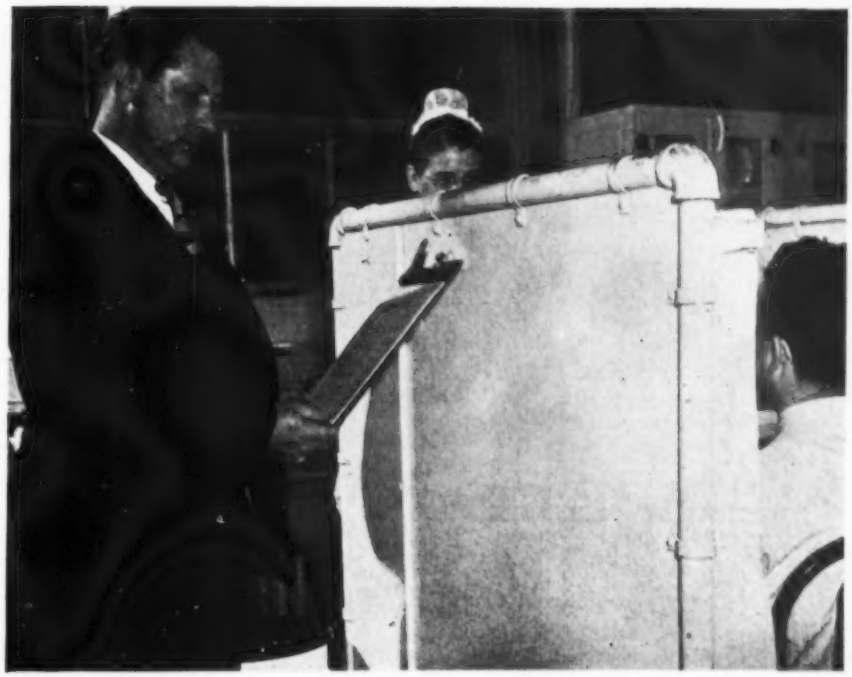
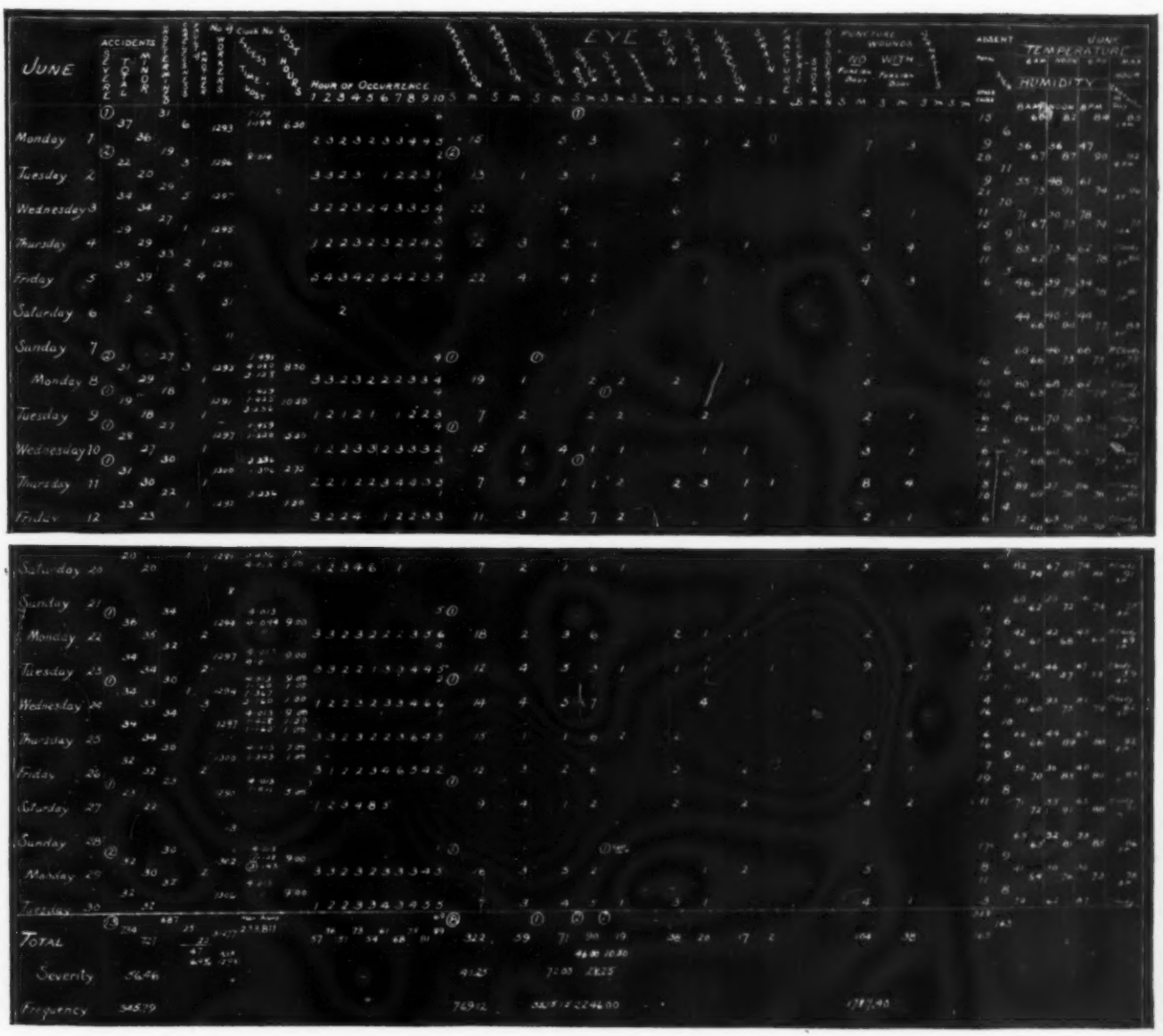


Fig. 45-C.

Fig. 46, below.



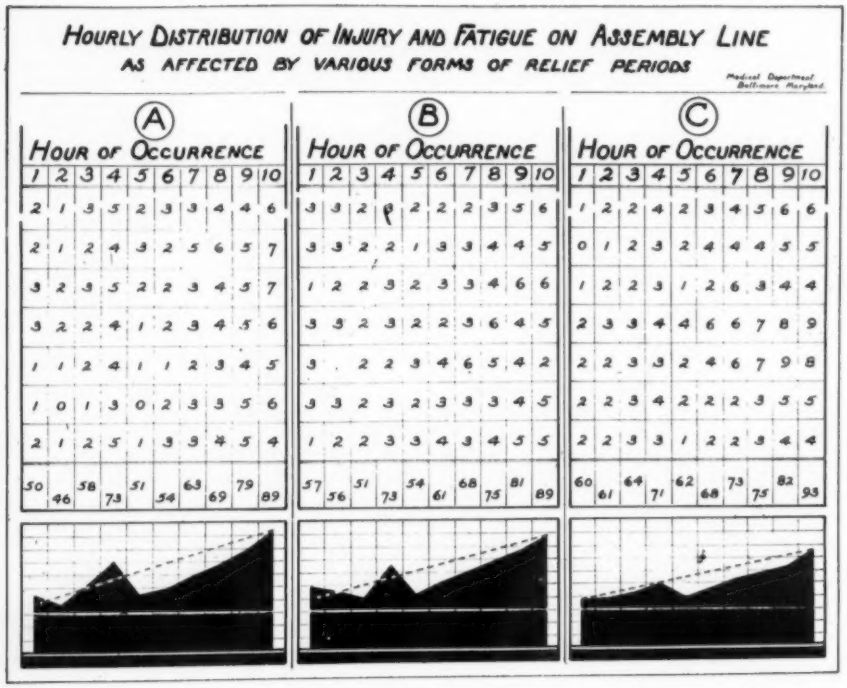


Fig. 47.

Omega, and furnishes the five "W's" of Safety—who—where—when—what—and why.

The graph shown in Fig. 53 (p. 33) using our measure of severity, registers the impact of this method of accident prevention on eye injuries. The onslaught began in August, 1937. The solid black curve is Frequency; the *line* is Severity. Comparing the Severity curve before and after that date leaves need for no further words.

WE HAVE established our measure of health along lines as simple as those for safety. (Fig. 55.) The total number of medical complaints reporting to the dispensary divided into the man hours worked gives us our Medical Frequency Index. Any case that, in the opinion of a professional staff member or doctor, is ill enough to be sent home is called Severe. The number of Severe cases divided into the total number of Medical cases gives us the ratio that we call our Medical Severity Index. This simple factor for expressing the day-to-day severity of plant sickness is of practical significance. From it, rising absenteeism can be predicted with an 80% accuracy. In 1941 one personnel director took measures to meet these anticipated rises in absenteeism over a considerable period of time, with a resulting reduction in chaos and cost that attracted the serious attention of management. Thus, studies made by an industrial medical department may be of value to industry in other than a purely medical sense. This is as it should be.

Based on a professional judgment of actual sickness and derived from an all-age cross section of local population, this Medical Severity Index bears some important relations to the science of public health. (Fig. 56, p. 34). Its curve shows striking

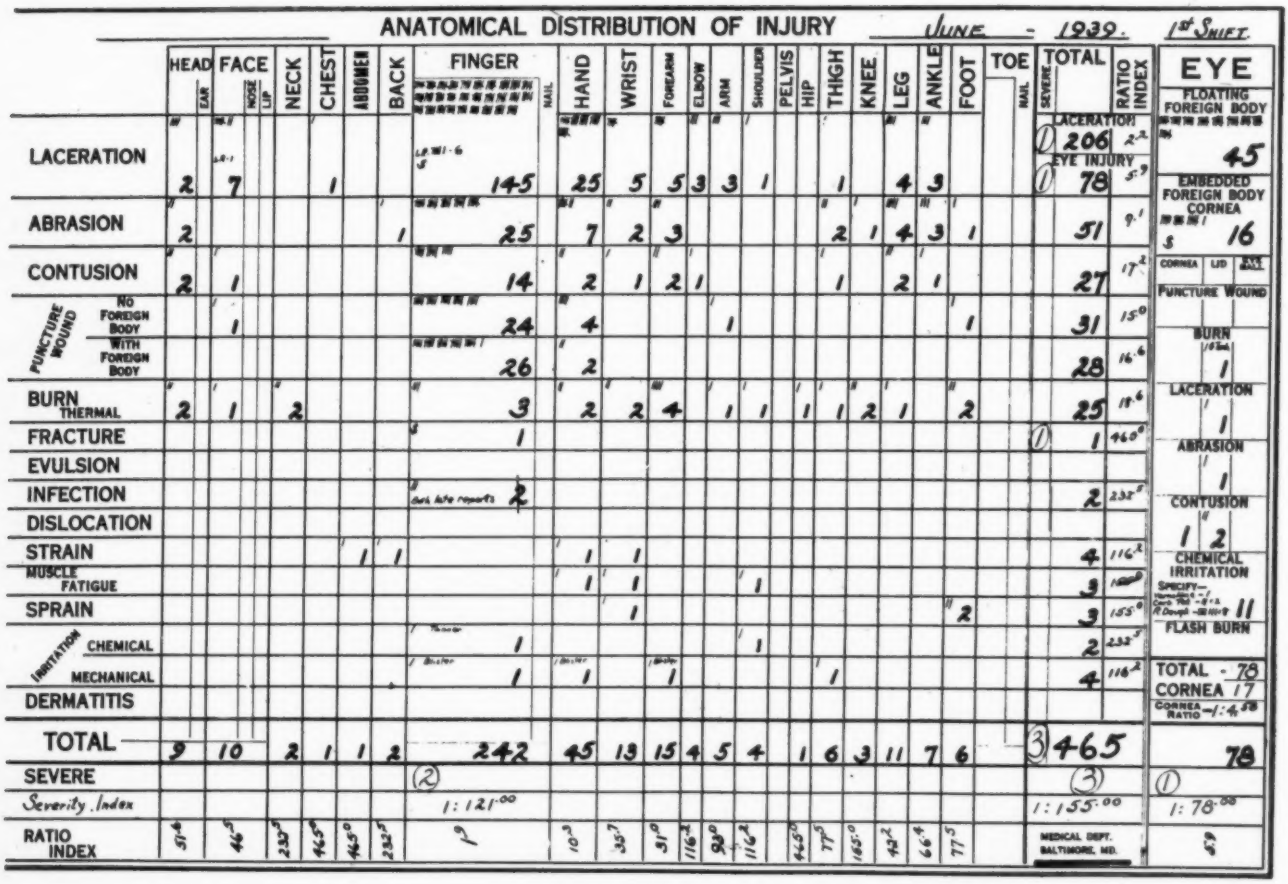


Fig. 48.

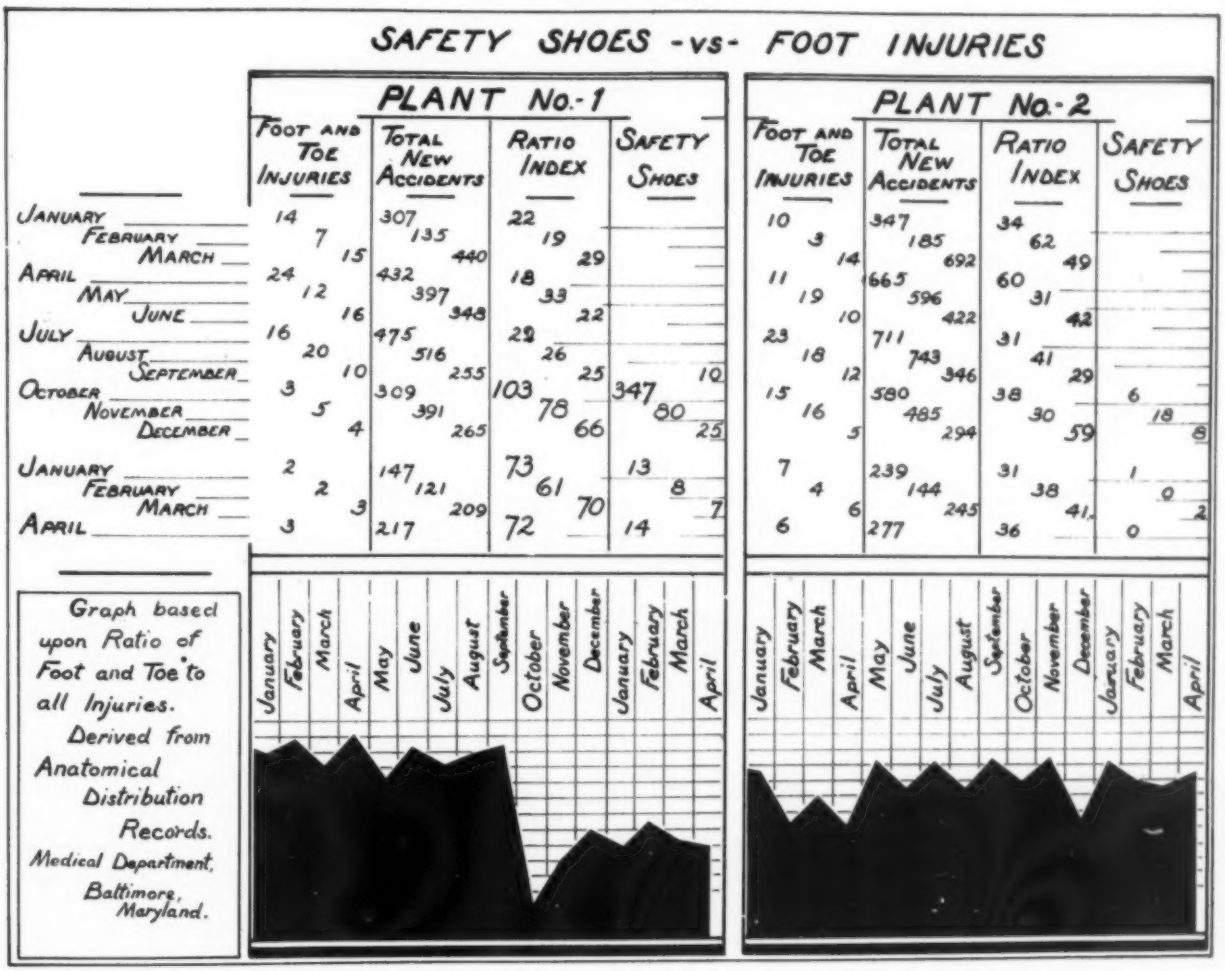


Fig. 49.

resemblance to that produced by public morbidity and mortality statistics. Observation and comparison over a number of years have caused us to go on record in many instances in forecasting epidemics that subsequently were noted by public health authorities and the press. It is understandable that industrial medical departments should be ahead of the public health authorities in noting an epidemic trend, for the authorities deal only with reportable disease while the industrial medical department deals with the minor daily illnesses that herald the more serious.

In relation to the national health, the course of this curve is in line with the general observations published by the U. S. Public Health Service. For instance, we recall 1938 as a rather healthy year. Our curve indicated the same trend.

A trend toward good health in 1942 was indicated by our measure. The trend as early as March, 1943, indicated a gain in good health over 1942 with a fair chance of breaking some records. The trend at this date (October 2, 1943) is much like that of the latter third of 1940. For lack of a better term we call this

MEASURING INDUSTRIAL SAFETY

FREQUENCY
(Frequency Index)

The number of man hours worked divided by the number of accidents occurring within that period of time equals the Frequency Index.

EXAMPLE

$$\frac{\text{Man Hours Worked } 4{,}338{,}582}{\text{New Accidents } 10732} = 404.26 \text{ (Frequency Index)}$$

One new accident for every 404.26 man hours worked

SEVERITY
(Severity Index) (INJURY)

The number of new accidents divided by the number of those deemed Severe (by the Medical Department) equals the Severity Index).

EXAMPLE

$$\frac{\text{New Accidents } 10{,}732}{\text{Severe Injuries } 102} = 105.21 \text{ (Severity Index)}$$

One out of every 105.21 new injuries is Severe

Any injury that reduces the efficiency of the patient 50% or more, for any period over four hours, regardless of whether the individual is paid or continues work, is deemed *Severe*.

SPECIAL INSTANCES

All *Fractures*, *Dislocations*, and *Amputations* are Severe

All *Lacerations* necessitating suture, regardless of extent of disability, are classed as Severe.

Eye Injuries necessitating more than one visit to the specialist are Severe.

All infections complicating compensable injuries and necessitating surgical drainage are Severe.

All determinations are to be based on sound, conscientious medical opinion.

Fig. 50.

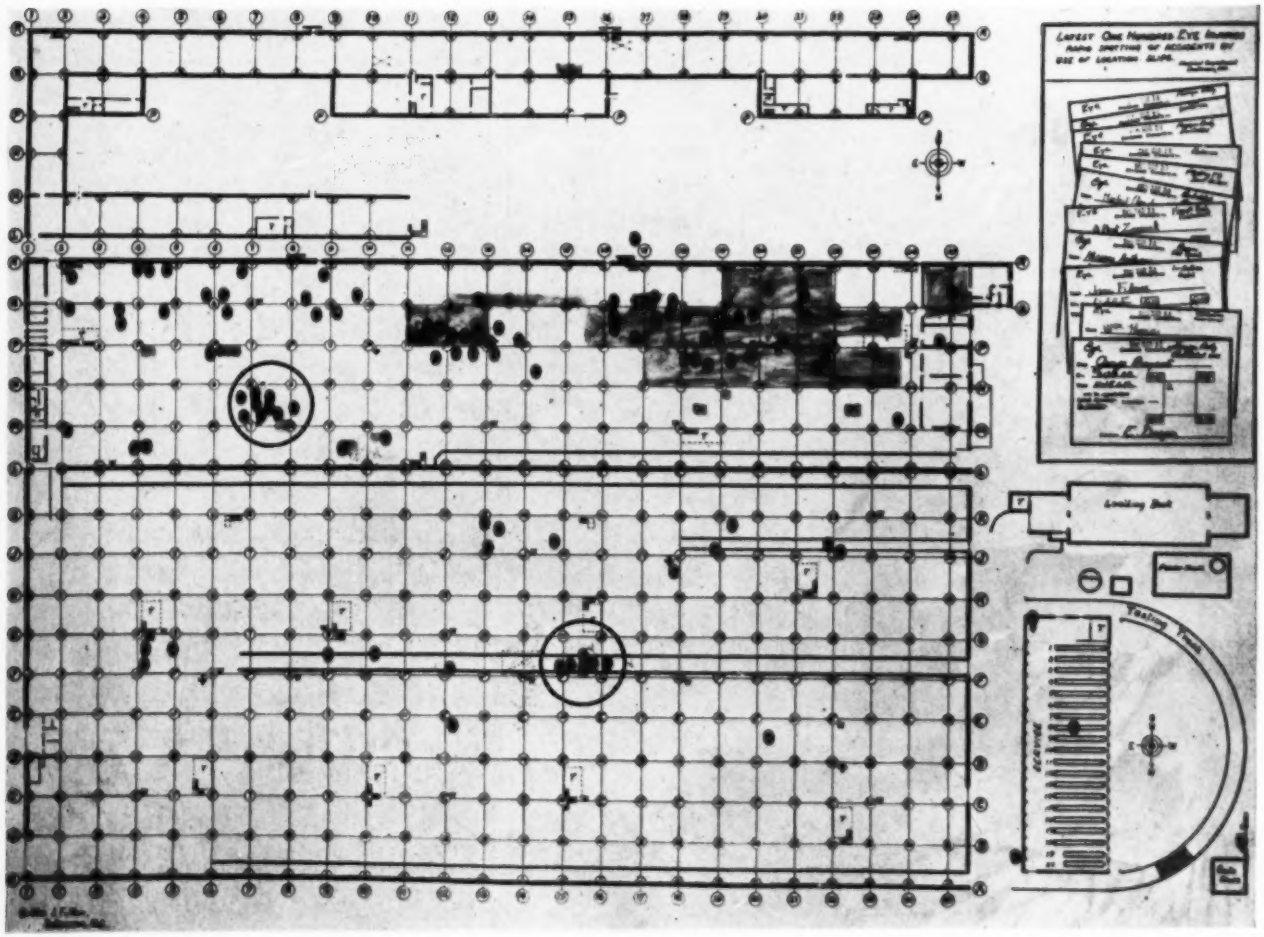


Fig. 51.

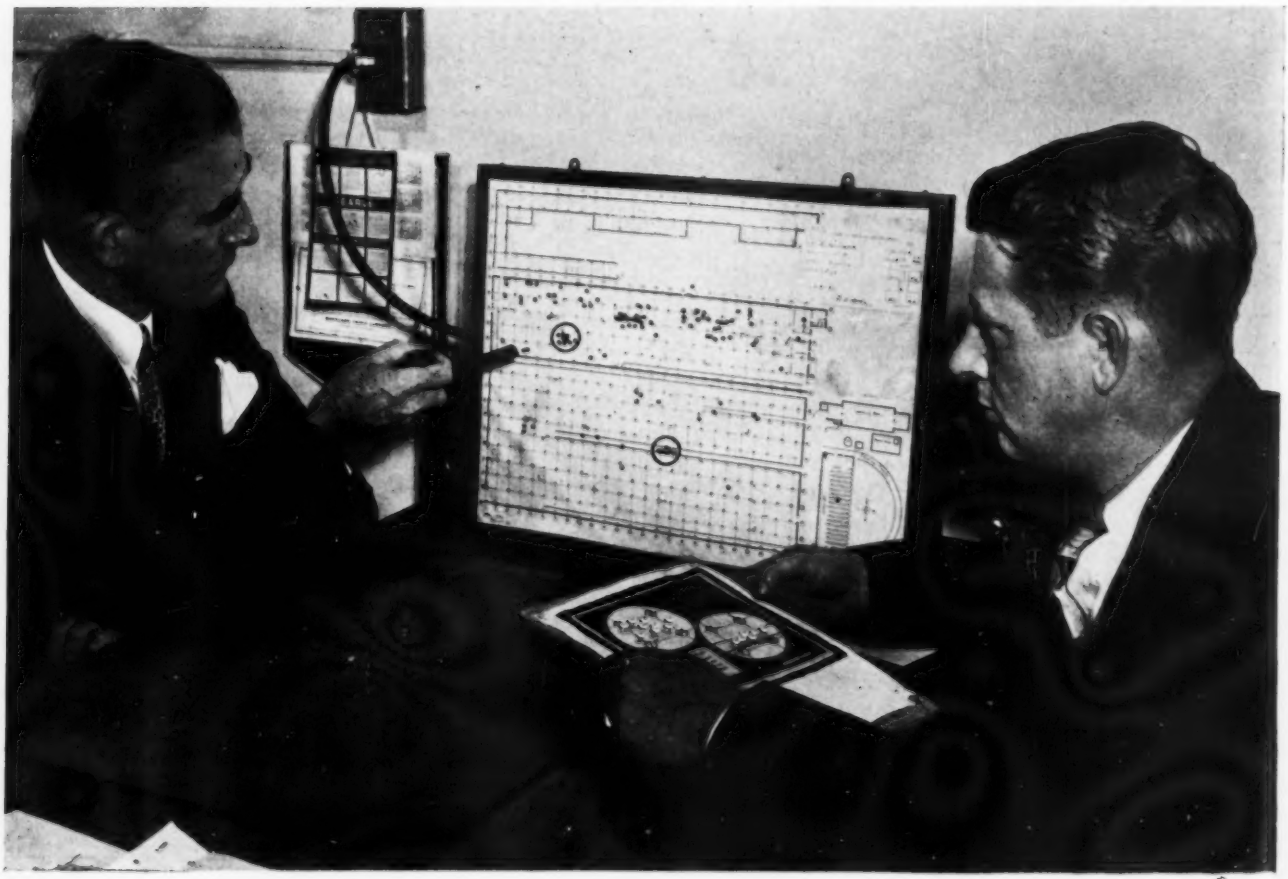


Fig. 52.

trend a consistent "endemic saturation" that bodes an epidemic rise of serious proportions before the 1944 New Year's bells ring out. Should this anticipated epidemic strike before then, the outlook for 1944 will be toward a decline in our present good health status.

It would be drawing a long bow to say that such a measure would point out a specific malady as epidemic. We do say, however, that it is an excellent indicator of a general health trend, and our past experience and observation enable us to spot an epidemic rise or general "good health" fall.

Who knows? Perhaps in some such universally adopted system industrial medicine may have the opportunity of being a cooperative partner with public health departments. Based on minor non-reportable morbidity, easily accessible and unique to industry, a veritable Weather Bureau of National Health may be built; a bureau capable of storm warnings of impending epidemics; able to fix the storm centers, trace their direction and movement, and anticipate their course; do all this before the storm of reportable morbidity and mortality has struck. A modicum of effort could put this conjecture to the test.

THE STUDY of one problem always points to others and frequently opens new fields of research. Parade this one before your fancies. Throughout the ages, the sick, the halt, and the blind have sought their medicine man. Today their march continues through the same doors. Our autopsy tables and specimen jars are filled with the pathological. What of those who come not? Those of our brothers, who, though exposed to the same ills, do not succumb? We do not find them in our clinics. Who are they and how can we find them? They are the legion of the well. The very silence of their blank records cries loudly to us. Industrial medicine can spot them with the highest degree of accuracy. You research workers in preventive medicine, in immunology, bacteriology, biochemistry, pharmacology, and a host of others, here is material for a vast frontier of scientific research, the edge of which is scarcely touched! What of vaccines from the bacterial flora of the well? What of a thousand other 'what of's"; in short, what of attacking our problems of ill health with the attributes of the healthy? The future holds vast promise in this field.

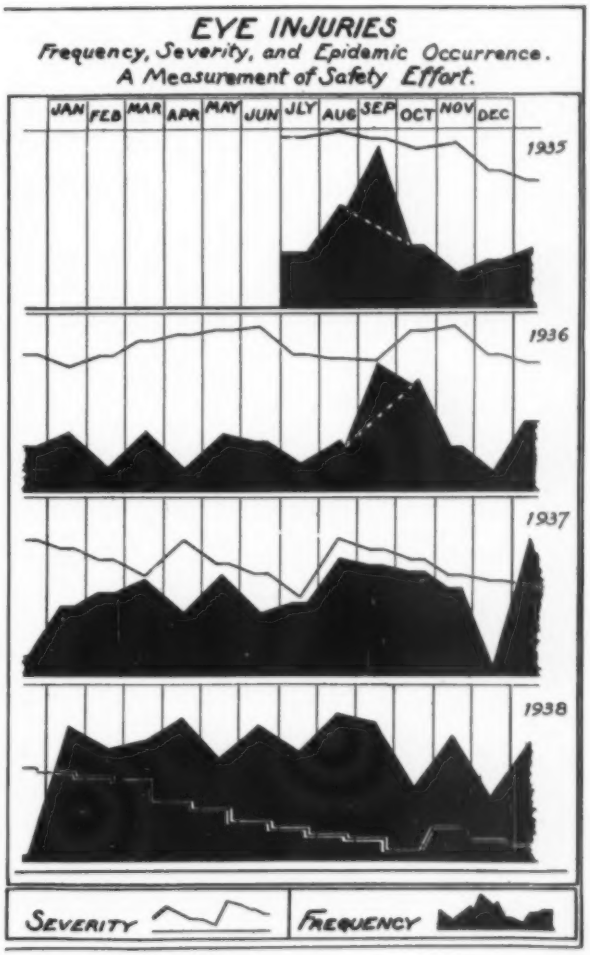


Fig. 53.

Thus we conclude, leaving it to you to decide whether or not the information accumulated in our one minute and 10 seconds of extra recording per case will prove to be a worthwhile investment. Our aims are set forth, and the basis for realizing them made concrete through the planning of various types of records. Our "seeing eye" is now ready to function. It warns of danger, the presence of unsuspected and alien influences; it automatically records and reveals data which enable us to improve the whole society of industry in health, safety, and mental hygiene. The "seeing eye" is a miracle of electrical engineering; records—our "seeing eye"—open the door to vast opportunities in human engineering. Dreams and medicine may not sound like a practical combination, but, if you would make progress, do not be afraid to see visions and work toward their fulfillment. A last thought: To its patients and to the nation, Industrial Medicine has much to give—nothing to sell!

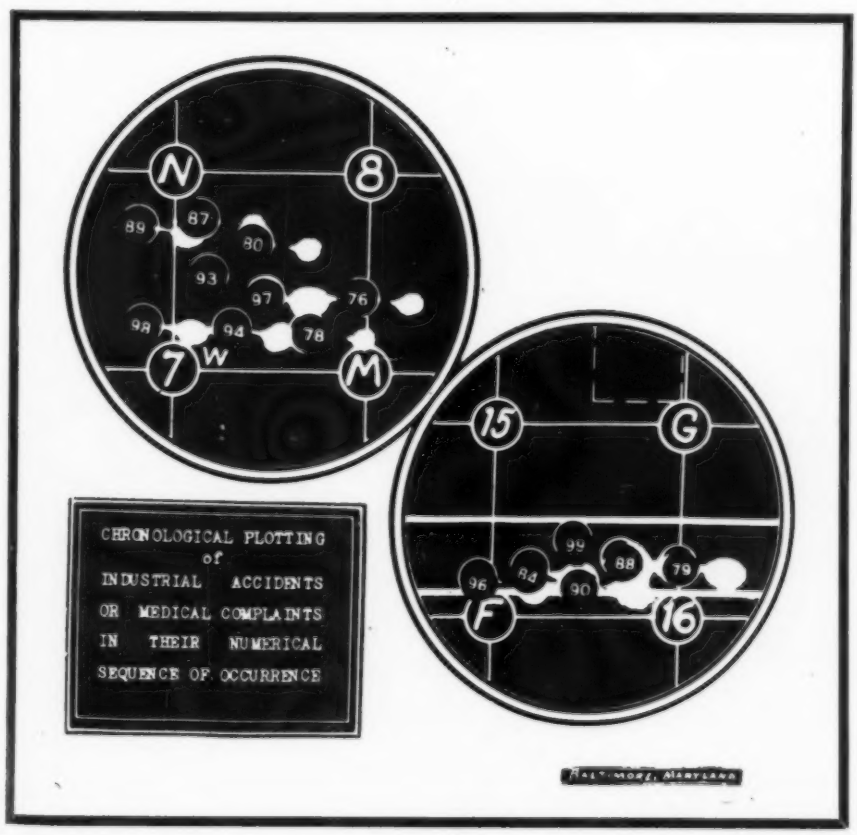


Fig. 54.

METHOD OF MEASURING INDUSTRIAL HEALTH

Medical Frequency Index

FREQUENCY (Morbidity Index)—The number of MAN HOURS worked divided by the number of Dispensary calls for MEDICAL complaints within that period equals the Medical *FREQUENCY INDEX.*

EXAMPLE: Man Hours 2,670,777 / Medical Calls 5007 = 533.40 (Medical Frequency)

One new medical call for every 533.40 man hours

Medical Severity Index

SEVERITY (Medical Severity Index)—The number of New Medical Calls divided by the number of those that are sufficiently sick to be sent home from work equals the Medical *SEVERITY INDEX.*

EXAMPLE: New Medical Calls 5007 / Sick—sent home front plant 223 = 22.45 (Medical Severity)

One out of every 22.45 patients sick enough to be sent home from work

EASTERN AIRCRAFT DIVISION,
General Motors Corporation,
2122 Broening Highway,
Baltimore, Maryland

Wm. J. Fulton, M.D.
Medical Director

Fig. 55.

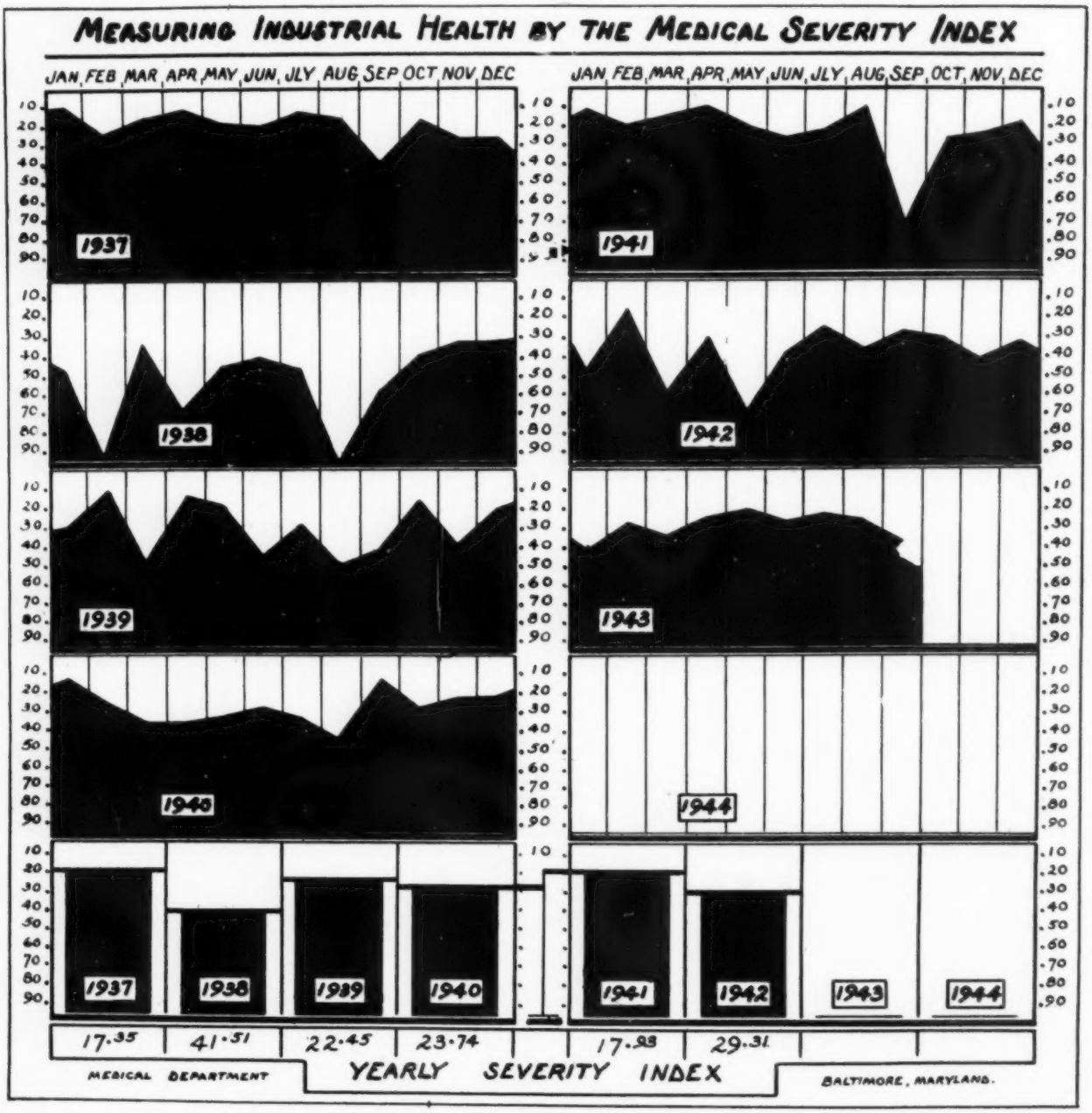


Fig. 56.

EXPLANATORY NOTES RELATIVE TO THE PHYSICAL EXAMINATION FORM. SOME CORRELATIONS BETWEEN AND APPLICATIONS OF THESE RECORDS.

The columns numbered 1, 2, 3, 4, 5, on the Physical Examination form correspond with those on the Request for Physical Examination form—Figure 26. The "S", "C" and "SA" on the latter form, stand for "Safety," "Medical Complaints" and "Sick Absenteeism" respectively. The ratings in these three departments are indicated in these first three columns on both forms. The additional columns 4 and 5 are provided for possible future use.

TO DEMONSTRATE THE COOPERATION of Medical Records with Employment, Safety and Personnel Departments, compare and correlate the following—

The Data, Ratings and Notes on both the Physical Examination record and Request for Physical Examination form (Figure 27) on the date of May 21, 1939—WITH—the entries of and prior to May 21, 1939 on the Index and Absent Records—Figures 21 and 24.

Do the same with the note of May 7, 1938 on the Physical Examination Record and the entries of and prior to May 7, 1938 on the Index and Absent Records.

RATING THE EMPLOYEE IN SAFETY, MEDICAL COMPLAINTS AND SICK ABSENTEEISM

Compare the volume of entries on the Index and Absent Records prior to the date of each physical examination with the table of Yearly Average (shown in Figs. 32 and 33) to justify all ratings in Safety, Medical Complaints and Sick Absenteeism.

MEASURING THERAPEUTIC EFFECT AND VALUE

EXAMPLE—On the Medical side of the index record (Figure 21) on the date of December 12, 1938 is the symbol vc/1 which indicates the beginning of a course of hypodermic catarrhal respiratory vaccine. Now compare and tabulate the number of Medical Complaints and Absences on the Index and Absent records due to upper respiratory and allied conditions* before and after that date. This method of analysis applied to this type of recording will produce *very definite* answers to the questions of therapeutic value and effect. This illustrates point number 3 in our discussion of "the values and varieties of application of this combination of individual records."

*The Medical Code used in Figure 21 has been greatly simplified since 1941. Prior to 1941 all of the upper respiratory and allied conditions were designated by the numeral 1 superimposed over other numerals, i.e. ¼ Cold; ⅕ Acute Tonsillitis; ⅙ LaGrippe.

Professional Medical Services

—In the Army Air Forces—

MAJOR R. C. PAGE, M. C.,
Office of the Air Surgeon,
Washington, D. C.

THE Commanding General of the Army Air Forces has charged the Air Surgeon with the Medical care of all Air Forces' personnel in accordance with War Department policy set down by the Surgeon General.

In 1939, prior to the expansion of the Air Corps, less than a hundred Medical Officers were assigned to duties with the Army Air Forces. At the present time, this number is slightly less than 10,000.

These medical officers are on duty in every part of the world. Those who are qualified flight surgeons, or aviation medical examiners, are assigned to tactical units at home or abroad. Other officers qualified professionally hold key positions in the 254 Army Air Forces Station Hospitals.

At the onset of the present conflict, the Air Surgeon accepted the responsibility of assigning a professionally qualified medical officer to duties commensurate with his professional background, and ability to adapt himself to the war effort. A correct medical assignment assures practical application, therapeutic efficiency and satisfactory morale. To this end, the Air Surgeon designated a special branch of the Professional Division of his personal staff. The primary function of this branch has been and continues to be, a conscientious effort to render and maintain the best possible medical care.

Those of us who are privileged to be associated with this effort have witnessed the growth of this branch and are able to observe the value of its function, both in the field and at the office of the Air Surgeon.

In May, 1942, one medical officer was charged with this duty. The Division now consists of five medical officers assigned to the office of the Air Surgeon; with capable specialists assigned to divisional areas in the field. An impressive list of eminent civilian consultants, cognizant of the problems which have to do with aviation medicine, work in close association with this group.

LET US now consider the doctor and how the Air Surgeon has endeavored to answer his problem. The professional qualification record of each medical officer as he enters the service is reviewed and graded according to his professional training and experience. Complete cross files are kept for ready reference in response to any type of need.

From the onset, it has been our purpose to place a highly trained professional man as key personnel in an Air Force station hospital where he is able to do a job commensurate with his ability. A recent survey in regard to the present duty assignment of 893 professionally qualified officers revealed that 877, or 95%, were assigned to duties compatible with their professional background. This practice has a noticeable beneficial effect upon the actual degree of professional standard and morale in all of our installations.

It has long been General Grant's wish that each Medical Officer be given every opportunity to complete his formal training in any given specialty. The most recent acknowledgment of this phase of our work, which it is my privilege to report, has to do with 56 Air Forces station hospitals. These have been approved by the Council on Medical Education and Hospitals, for Resident training. Now it is possible for the youngsters who qualify to obtain a year of hospital credit towards certification by the American Boards of Internal Medicine and Surgery.

Those medical officers who have had several years of formal hospital training, prior to entering military service, whenever possible are assigned as assistants to the various chiefs of service.

One of the most unique, practical, and efficient innovations, in regard to therapy, is the Convalescents Training Program. Since its inception in January, 1943, it has received much favorable comment. One of our associates, who was at that time stationed at Jefferson Barracks, became cognizant of the necessity of utilizing every teaching hour. He envisioned the possibilities of conscientious, practical mental teaching and physical rehabilitation, from the time that the critical phase of an illness has ceased, to the time the patient is able to return to full military duty.

It is now the function of this Convalescent Program to utilize these tedious hours in the interests of the convalescent patient, as well as the country which he serves. At the present time, in our Air Force hospitals, there are in excess of 500,000 convalescent hours so spent each week. A medical or medical administrative officer supervises these programs; the time required by each officer so assigned is approximately 14 hours weekly.

The program reconditions a man physically and mentally during the period of his convalescence, thereby enabling him to carry on full training routine when he returns to duty.

Physical reconditioning is accomplished by graduated physical exercises and calisthenics, the mildest forms of which are given to bed patients. In addition to the routine of the physical training program, there are special classes for orthopedic rehabilitation under the direction of the orthopedic surgeon in charge.

An educational program for mental improvement and stability is also organized. In the basic training centers, men are given special courses in self-protection, gas warfare, camouflage, booby traps, map read-

Read before the meeting of Chiefs of Service, Fourth Service Command, Atlanta, Georgia, August 5, 1943.

ing and first-aid. In the hospitals serving the flying fields and tactical units, geography, geopolitics, airplane identification, reptile-insect-pest control, arctic and tropical medicine, and sanitation, are the subjects stressed. Phonograph records for the teaching of 30 languages and dialects, have been made available to our hospitals. From these it is possible for a soldier to acquire a vocabulary of 150 words in seven hours of study.

Twenty percent of the instructors in the Convalescents Training Program are from the camp, post, station, and the medical departments of station hospitals. Eighty percent are convalescent patients who have had special or unusual military or pre-military training. For example, soldiers who have been overseas discuss informally their experiences. The medical staff lectures on subjects which will aid the soldier in orienting himself with his new environment.

In the rehabilitation-reconstruction phase that is to come, it is our feeling that the trained, organized personnel, conducting the Convalescents Training Program should be readily integrated to meet the needs in this new field.

I NOW WISH to tell you something in regard to the tactical side of the Army Air Forces Medical Service. This will be discussed under three headings: the Flight Surgeon, the Medical Set-up at "Group Headquarters," and Air Evacuation.

The job of the Flight Surgeon entails all of the admirable qualities and capabilities of the family doctor. In addition, he must like to fly; he must like people; and he must be liked by people. He must be enthusiastic, interested and purposeful in the approach and application of his medical knowledge to the needs of flying personnel. These facts explain why much care is exercised in the selection of medical officers to go to the School of Aviation Medicine at Randolph Field, Texas.

At the onset of this present conflict it was determined that something had to be done to improve the caliber of men permitted to fly. On this foundation, the whole field of Aviation Medicine has become a specialty all its own. It deals with the effects of changes in barometric pressure, exposure to cold, extreme force, acceleration, noise, and anxiety that each man either consciously or unconsciously experiences when he enters an aeroplane.

At the School of Aviation Medicine, an intensive nine weeks' didactic course on the theory and practice of aviation medicine is given. I am personally aware of its intensiveness, having attended classes daily from 7:00 A.M. to 4:30 P.M. with calisthenics or drill until 5:50 P. M. six days a week. The class totalled 300. We arose at 5:30 A. M. and, in order to make the grade, much midnight oil was necessarily burned.

The course included lectures in psychiatry, psychology, ophthalmology, otolaryngology, tropical medicine and high altitude physiology. Throughout the entire course, attention is constantly directed to the application of these specialties in problems of aviation medicine.

The duties of the Flight Surgeon, for practical discussion, may be divided into two main parts: First, the performance of the "Six Four" examination, in other words, the "physical and mental" selection of the potential member of the air crew; and secondly, the "maintenance" of the graduate pilot, bombardier, navigator and gunner.

It is perhaps fitting to elaborate further upon these two phases of the flight surgeon's work. The "Six Four" examination includes not only a thorough physical examination, but also a severe "mental going over" by an Aviation Medical Examiner so experienced that he can give an opinion as to the total personality of an individual. This is the so-called ARMA examination or "adaptability rating for military aeronautics."

Each medical examiner endeavors to select only those who will make the grade. It would be ideal if his selections were always correct. Unfortunately, there is no over-all rule to go by. Intelligence and physical and mental stability are not all of the prerequisites of a flyer. He must also have the courage and desire to fly. Subject as his body is to changes in environment, so is his mental make-up. Such changes must be detected in their incipiency to be of total value to all parties concerned. And so it is that "maintenance" is by long odds the most important phase of the flight surgeon's work in time of war. He must know the flyer's likes and dislikes, his moods and eccentricities. Such intimate knowledge is fundamental in the detection of early flying fatigue or anxiety state. The individual pilot is the basic unit of the Air Forces, and the success of his squadron, group, wing and entire Air Forces is his responsibility. When his efficiency is lost, so is the war in air.

Therefore, it can be said with much feeling that the responsibilities of the flight surgeon for Air Force personnel are immeasurable—he is friend and benefactor, specialist, and family doctor to his crew. He is the first line of defense and the best insurance possible for keeping his crew in top combat efficiency, thereby preventing loss of life and destruction of property.

Every effort is made to provide adequate and efficient medical care of our fighting forces, which includes both the flying and service personnel. In the field, the center of all medical service is the medical section of the "group headquarters." Located here is a well equipped 12-bed dispensary, which is expansible to 24 beds in the event of need. Emergency medical and surgical care is rendered prior to transfer to a numbered station or general hospital within the theatre of operation. In the African theatre, where this procedure was originally instituted, the results are recorded as successful.

Normally the group, and all squadrons, will function from a group operational area. When rapid dispersal is necessitated, each squadron is provided a small "squadron aid station."

All such medical units are completely air borne. Jeeps are used in the place of the field ambulance.

Patients are removed from the field of battle by air evacuation. Transport planes which carry the paratroops, air-borne troops, equipment and supplies forward in the theatre of operation are utilized to transport the sick and wounded to field hospitals hundreds of miles to the rear.

The original plans for this organized medical air evacuation service were prepared by General Grant several years ago. At the present time, by the utilization of the large four-motored Air Transport planes which fly daily to and from the theatres of war, it has become possible daily to return many patients to the homeland. Air evacuation complements sea evacuation. In certain areas, owing to the geographic and military situation, it has completely replaced it.

Within the continental limits of the United States, air evacuation is accomplished by local air facilities or by direct request to the First Troop Carrier Command.

In summary, there are three points which I should like to leave with you: (1) the Air Surgeon has organized the medical service of the Army Air Forces by the prudent use of the trained physician; (2) research

and training in the special field of aviation medicine are an ever growing and continuous process; and (3) by conscientious coordination and integration of these principles each individual in the Army Air Forces is receiving the best possible medical care.

Employability of the Tuberculous

—A Yardstick for Judging Placement and Supervision—

WAYNE L. RITTER, M.D.,
J. W. DUGGER, M.D.,
Division of Industrial Hygiene,
Mississippi State Board of Health,
Jackson

TUBERCULOSIS is given as a cause for rejection of employment in every company that has gone so far as to develop any printed statement on this subject.

Since approximately 25% of the population has at least a primary pulmonary complex, it would appear ingenuous to believe that this statement refers to so large a group of people. The reference probably applies to active tuberculosis. With such a statement, certainly no one could find objection. But what of the great number of cases that fall between these two extremes?

Fortunately more and more of the individuals with evidence of tuberculosis are being found in early or inactive stages. Individual decisions on these cases which arise every day in pre-placement examinations in the large plant have begun to establish patterns of sound management policy. It might be well for the small plants to be guided by such experience.

We know that many handicapped people make good employees, if proper medical supervision is available. But the reverse of this is even more true—without proper job placement and adequate medical supervision, the employment of the physically handicapped may sharply increase insurance and operating costs.

As a rule, insurance rates are appreciably higher in the small plants than in the larger ones. Much of this has been proved remediable by well organized health and safety programs. As another step in the organization of such services, let us consider what are now thought to be sound criteria for the evaluation of employability of the tuberculous.

Because other diagnostic methods are more expensive and sometimes difficult to obtain, skin testing may be used as a screening method for deciding upon whom to x-ray when a survey of a large group of people is contemplated. Between 40 and 65% of adults show a positive reaction to such a test. This, of course, only indicates past experience with the tubercle bacillus and a need of the accuracy of x-ray diagnosis. A skin test alone is neither a fair nor an accurate enough guide to accept as a basis of employability. Further, because most of such tests require their being read after 48 hours, the method is scarcely suited to pre-placement examinations.

Without x-ray facilities, it would be presumptuous to suppose that the physician in the necessarily rapid routine of industrial physical examinations could screen out more than a few of the advanced cases. Since this is true, it would be well for the plant physician operating under conditions where there are inadequate x-ray facilities to advise his local management that he is only human and cannot be expected to find a very high percent of the employees who are suffering with this disease. Unless management is willing to make arrangements for such diagnostic facilities, they must expect that approximately 2% of their employees will be tuberculous—a condition both infectious and contributory to sick absenteeism and labor turnover.

Where a potential hazard of silicosis exists, at the present time it seems the part of safe practice to exclude from such exposures all those under 45 years of age who show any adult type re-infection disease. Those over 45 years of age with adult type re-infection disease could be employed even under these conditions if the area involved is small and well healed with the characteristic 'hard' or 'stringy' shadows. These criteria* are based on the assumption that the great majority of tuberculous re-infections develop before the age of 25; by 45 these lesions have either developed into clinical disease or healed without residual foci containing viable organisms.

Such a severe borderline is necessary only for those employees who might be exposed to silicious dusts. Such an exposure could reactivate an incompletely healed lesion. As a rule-of-thumb, the other 'dusty trades' would be well advised to employ only those with healed lesions. There is no convincing proof that other types of industrial employment light up old pathology. Employees with well-healed re-infection type disease could, therefore, be safely placed in all other jobs except manual labor of the most arduous type.

Our next consideration should cover the quiescent or arrested case, which can be defined for our present need as an ambulatory case that has been under competent medical supervision for at least the previous six months and shown no evidence of activity. In all these cases, it would seem that top management should make the final decision as to their employability, since this will necessitate a fair amount of medical supervision. Such cases should not be employed in any organization where automatic medical supervision is not assured. The needs of a given job might not justify this time and expense.

These arrested cases should not be employed on jobs requiring more than moderate or intermittent physical work. Three negative sputum examinations following each sick-absenteeism should be required. A chest x-ray every three months should be insisted upon.

From an industrial point of view, it is probably wisest to consider all cases that have had therapeutic chest surgery as needing *at least* this much placement and medical supervision.

INDUSTRIAL employment must be deferred for job applicants with active tuberculosis. Since the employer has an obligation to the community with respect to rehabilitation, activity of tuberculous lesions developing during employment should indicate a furlough for treatment; not termination of employment. The criteria for the recurrence of activity should include not only roentgenological evidence, but also increases in sedimentation rate or febrile reaction. Although these patients might not be passing infection to others at the time, employment would be against their own best interests, and a serious potential danger to others.

All cases having any discharge containing tubercle bacilli must be prohibited from any employment in the plant. The need of this rule is obvious not only to protect the individual, but also his associates. Free examinations of all such material are available at no cost at the laboratory of the State Board of Health. The collection of the sputum specimens would be, of course, one of the routine responsibilities of the industrial nurse in plants where such graded risks were accepted.

With the eradication of bovine tuberculosis, the incidence of tuberculosis of bone in humans is rapidly declining. There are no criteria for determining abso-

*GARDNER, DR. LEROY U.: personal communication.

lutely that bone tuberculosis is healed. A tuberculous joint that is not fused is an extremely hazardous risk because of the chances of recurrence. Any tuberculosis of the bone is subject to exacerbation from trauma —as with all the residuals of suppurative bone pathology, they should not be employed when someone else is available to do the job; or if accepted at all, only the most sedentary work should be permitted them.

The development of adult type reinfection disease may be found on periodic examination. These cases may be entirely asymptomatic and go on to complete healing without any change of occupation or loss of time from employment. But the acceptance of such cases should not be a routine in the plant unless frequent sputum and roentgenological examinations are available as an automatic part of the medical service.

In industrial pre-placement and periodic examinations, the physican must remember that management is much more interested in prognosis than diagnosis.

To insure cordial relations in plants having unions, it is usually wisest to discuss in advance the employment of borderline physical risks with the union management. This procedure should be as automatic as the purchase of insurance on a new house, and for the same reason.

Pulmonary tuberculosis is principally a disease of those between the ages of 15 and 45. This age group corresponds with that of the bulk of our industrial workers. This disease would, therefore, be particularly adapted to control by thorough industrial physical examinations followed by a sound and consistent policy of placement and medical supervision.

SUMMARY:

I. Primary infection (pulmonary complex) calcified or healed: no restriction as to employment.

II. Re-infection disease (adult type):

A. *Healed and stable*:

1. Minimal involvement:

(a) Employee: no restriction of employment except III A.

(b) Applicant: any job no more strenuous than last previous one.

2. Moderate involvement:

(a) Employee: no restriction of employment except III A.

(b) Applicant: any job no more strenuous than last previous one.

3. Far advanced:

(a) Employee: continue present job.

(b) Applicant: employed only on light work.

B. *Arrested, quiescent or questionable:*

1. Minimal involvement:

(a) Employee: continued on job requiring not more than moderate or intermittent physical work. (See III B, Supervision.)

(b) Applicant: employment as emergency measure for sedentary job. (See III B.)

2. Moderate involvement:

(a) Employee: light work or furlough for observation.

(b) Applicant: preferably deferred, or temporary sedentary job.

3. Far advanced:

(a) Employee: sedentary work or furlough for observation.

(b) Applicant: deferred.

C. *Active lesion:*

1. Employee: furlough to sanatorium for treatment.

2. Applicant: refer to local health authorities for follow up.

III. Additional considerations:

A. *Placement and transfer:*

1. No employee under 45 with *any* re-infection disease to work in an area with silica dust.

2. Employees over 45 to have such work only when they have minimal well-healed lesions.

3. Transfer of employees under medical supervision is not to be done without the approval of the medical department.

B. *Medical supervision:*

1. The best job placement is not to be confused with adequate medical supervision.

2. An arrangement for subsequent x-ray studies is to be made at the time of the pre-placement examination of every employee having evidence of adult type disease in any form.

3. Weight records, afternoon temperatures and sputum examinations are to be rechecked following each sick absenteeism in all arrested cases—additional x-ray studies will also be made in case of any doubts.

4. The decision on cases furloughed for observation or treatment at the sanatorium and the decisions on cases returning to work from observation or treatment should result from consultation with the family physician and State Tuberculosis Control officials.

The authors wish to express their appreciation for the editorial assistance given them by DR. LEROY U. GARDNER, Saranac Lake, New York, and DR. A. G. KAMMER, Medical Director of Inland Steel, whose active control program has been in effect for a number of years.

Repair of Tendons by Transfixion

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VARIOUS methods have been described for the repair of lacerated tendons, all of which are sound provided they meet the general principles essential for good results in hand surgery. These principles as laid down by Kanavel and followed by his able successor, Koch, are correct and sound. They are briefly: *immediate surgery, cleanliness* and *debridement, asepsis, delicate handling of tissues, apposition of structures* with *fine materials, immobilization of the injured structures,* and later, *rehabilitation.*

I shall review the principles briefly. First, immediate surgery. Tendons must be repaired early, i.e., now, not tomorrow morning or after hours, but as soon after the accident as one can get to the hospital. Therefore, it is imperative that immediate repair be done if good results are desired. That is the number one secret of tendon surgery.

Cleanliness is just as important as immediate surgery, for when the one is attempted without the other, only failure results. Koch has repeatedly emphasized cleanliness of the wound and its adjacent tissue as being of prime importance. The principle of cleanliness is sound and must be carried out, but the method can be improved. An injured hand should be more thoroughly cleansed than that of the operator. There is only one place where this cleansing can be carried out properly and that is in the doctors' scrub room under continuous running water, with the use of the soap and brush, of course. The brush is not to be used in the wound. It is impossible to cleanse an injured hand in the operating room properly unless the operator is provided with hip boots, because it takes gallons of water to cleanse an injured hand. The wound itself should be cleansed under continuous running

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water after the hand has been thoroughly scrubbed. Local infiltration anesthesia may be used when possible, or general anesthesia while the patient is on the cart in the scrub room, and then, under the same continuous flow of running water, the wound may be debrided with a sharp scissors. The patient is now ready to be removed to the main operating room where the wound is again irrigated with saline and repair begun. We now have a clean operating room, a clean surgeon, and a clean wound. I use a large arm board with a pan insert covered with a wire sccreen, and a tube from the pan draining any irrigating solutions into a pail on the floor. This makes irrigation of the wound very simple, and much more fluid can be used for irrigating purposes without getting it all over the operating room floor.

It is my belief that immediate repair, cleanliness and debridement are the most important things in the repair of tendons to get a satisfactory result. I have repeatedly repaired tendons without the use of gloves, without the use of masks, and have had good results. Likewise, I have had failures when this procedure has been carried out in the operating room under ideal conditions with everybody capped and masked, and everybody wearing gloves, only to have an infection develop in the wound. This proves one thing to me, and that is that the infection is in the wound and is not brought there by the surgeon, if the wound is properly cleansed.

The use of fine materials, fine instruments, and delicate handling of tissues all goes, needless to say, to make up fine surgery. This, of course, should be combined with skill, speed, and dexterity. It is important, therefore, that in the approximation of the tissues, fine materials be used, and I say the finest of material that is possible to stand the strain that is required in this type of work. One many use either absorbable or non-absorbable material provided it is very fine.

WE NOW come to the purpose of this paper which is apposition and retention of the structures which, of course, is very important and the purpose for which surgery of the hand was started. The method which I am about to describe is another method for the apposition and retention of severed tendons. It is a way of retaining the severed tendons in position by transfixion with the use of a small pin passed through the the body of the tendon some distance away from the wound. I do not mean to imply that all tendons may be or should be repaired or held in position by transfixion, but the purpose is only to show that some tendons which are lacerated in positions difficult to repair can readily be held in place by transfixion without causing a harmful, wide incision. Several of these locations are the flexor creases in the fingers, lacerations at the bases of the fingers, and the extensor group of tendons because they are so very superficial. The method is to pull the contracted tendon down far enough so there is plenty of slack on the exposed area. Then, by passing a needle or pin through the tendon at least one inch from the wound, one immobilizes it and the pin is left in place. Then, by a simple, fine suture, preferably chromic triple O or fine cotton, a simple loop may be passed about the ends of the tendon merely to hold them in place. The wound is closed in the usual manner and the extremity held in either flexion or extension according to which tendon has been severed. The member may be anchored to the transfixion pin which has been passed through and through and held in position that way. The dressing about the pin should be daily saturated with alcohol to prevent infection. The transfixion pin is left in position for approximately 10 or 12 days. Thus, one more principle in tendon surgery has been added, namely, the prevention of tension on the suture line at the point of repair. Healing is much more rapid and, so far, the results are superior to the other method. One of the prime principles in surgery is to prevent tension on a suture line and, in this method, we have eliminated the tension along the suture line. As I said previously, this method applies only to certain lacerations in certain locations. Lacerations in tendons when there is a heavy covering, as in the palm, should be repaired in the usual manner, i.e., by suturing. It is my belief that transfixing the tendon above the point of laceration and eliminating the stress and strain on the suture line will cause healing to occur more rapidly and bring about a better functional result.

Follow-Up and Periodic Examinations

—of Employees—

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PRE-EMPLOYMENT and annual physical examinations of employees have been a part of the program of our medical division since 1914. The former were instituted to assure a supply of reasonably healthy men and women who might be expected to carry on the average duties in an organization such as ours. The purpose of the annual physical examination is to detect any condition which developed since the last inspection or to bring under observation and supervision individuals with suspicious or questionable impairments. Since we are apt to be dealing in the main with early or slight changes, subjective appreciation of symptoms usually is lacking, and an objective survey is most practicable in either a pre-employment or annual checkup. In addition to the detection of abnormalities, an annual examination offers an excellent opportunity to establish a friendly contact with the employees, and can lay the groundwork for future voluntary visits for advice or consultation. Probably the average person looks upon a physical examination as a nuisance and waste of time, but there is a satisfaction and relief in knowing that nothing of a serious nature is found.

Our annual examination is required. We call the employee for examination on the anniversary of the pre-employment examination, which we have found gives us a smooth flow of work. The appointments are made one day in advance and are kept pretty promptly. If a section is particularly busy or a person has a good reason for not coming on a specified day, we change the appointment within reasonable limits. Also we know that there are particularly busy hours in the medical division and we do not make appointments then.

The annual examination includes a general inspection, recording of weight, blood pressure, examination of heart and lungs, fluoroscopy of heart and lungs, and urinalysis. For the employees age 40 and over, we include an annual electrocardiogram, and x-ray of the heart at periodic intervals. An annual serological examination was made for some years and is carried out now at three-year intervals, except for food-handlers and persons with a positive serology who are examined yearly. By custom, it has become an estab-

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The text of DR. FELLOWS' Lecture, given at the Post-Graduate Course in Industrial Medicine, Long Island College of Medicine, November 2, 1943.

lished practice that, when an examination is satisfactory, no word is sent to the employee, but if anything is unsatisfactory or questionable, the person is requested to return to the medical division and the situation is explained and investigated further, and, if advisable, the person is urged to consult his family physician. For several years we gave a printed slip to each employee at the time of examination explaining this procedure and also encouraging him to discuss any matters of personal health with the examining physician or the physician in charge. All of our medical records are considered to be confidential, and the information thereon is not available without authorization by the individual involved.

Frequently an annual examination gives information regarding either a functional or organic condition which will be of value in proper work adjustment. It is our belief that the exposure to a positive health program over a period of years is of some public health and medical value. The results of annual examinations are tangible as well as theoretical.

In our experience, the routine fluoroscopic examination of the lungs has been the most valuable single procedure, inasmuch as we believe it has brought our tuberculosis problem as well under control as is possible. Briefly, the facts are as follows. For the eight years prior to 1927, we invited to our company-maintained sanatorium at Mount McGregor an average of seven persons with pulmonary tuberculosis for every thousand home office employees. Of these, 70% were in the advanced stage and 30% had minimal lesions. With the inauguration of a pre-employment and annual fluoroscopic examination of the lungs in 1927, this picture changed rapidly and, in the last eight years, the number of employees with tuberculosis has averaged just over one per thousand, and the stage has been reversed completely, with an average of 23% advanced and 77% minimal cases. This would not have been surprising if during this period the amount of pulmonary tuberculosis among applicants for employment had been diminishing, but up until 1941 there was no such drop, the incidence remaining practically unchanged from 1928 through 1940. In 1941 and 1942 there was a diminution which we may reasonably believe and hope will continue. The decreased number of patients together with an increasingly favorable clinical picture, because of the large percentage of minimal cases, has saved money, decreased mortality and days of illness, and increased the chance of cure and rehabilitation.

IN TERMS of general usefulness and sheer numbers involved, probably the dental division is of service to more employees at an annual cleansing and examination than any other procedure. The years 1941 and 1942 are typical examples of the work done, when 32,000 and 30,000 new dental defects were found among 15,000 employees. These were brought to the attention of the employees, with the result that practically all were cared for, there being only about 450 cases of neglect among the large number of persons involved.

Heart disease, both valvular and myocardial, is found not infrequently, usually with symptoms or signs. Illness intervening between examinations may activate or initiate the former, though occasionally an organic murmur will be detected which we believe was silent formerly. We know that severe myocardial damage may develop without the person being aware of it, and usually this is detected by electrocardiographic examination. Since 1930 we have included an electrocardiogram at the annual examinations of employees 40 years of age and older and this procedure has brought to light each year a number of cases of this type. Frequently the attack has caused symptoms unrecognized at the time, though in many instances the damage has come about quietly and without recognition and the probable time of occurrence cannot be determined.

Definite hypertension rarely develops between annual examinations. As a rule there is a gradual increase from year to year, or the blood pressure may be elevated intermittently before hypertension is established. The recognition of either method of onset brings a case under observation and supervision.

There are a variety of conditions which come to our attention in small numbers each year, among which are diabetes, tumors, especially of the breast or thyroid gland, and Graves' disease. A marked gain or loss in weight may indicate an underlying condition of importance, as does a generally "below par" constitution.

Symptoms are also useful when present and brought out, and may determine the necessity for some special procedure. Gastro-intestinal symptoms typical of ulcer or gall-bladder disease may indicate the necessity for x-ray examination, or an unusual menstrual history may indicate that a pelvic examination should be made. These are typical examples of the value of eliciting symptoms which can be done only by establishing a friendly contact with the employee.

Possibly the value of an annual examination cannot be established on a dollar basis, though much might be said on that score. There is, however, no gainsaying the statement that, when performed properly and followed through wisely and successfully, it is of real benefit from the standpoint of personal health.

The Hemospast: A New Instrument

—A Simplified Technique for Taking Blood Specimens—

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and
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THIS instrument has been developed to overcome the difficulties encountered in promoting blood testing programs for the detection of syphilis in industry and other large groups. This new technique is based upon the use of a standard 10 cc. blood specimen vial, a standard blood letting needle and a new instrument, the Hemospast.

The value of blood examinations for syphilis in industrial workers has been recognized for the past several years. While the importance of industrial serology is generally accepted, the actual inclusion of the blood test in industrial medical examinations is by no means a universal practice. The Bureau of Industrial Hygiene of the Michigan Department of Health has done considerable work to bridge this gap between acceptance of the value and the actual inclusion of the blood test for syphilis in the industrial medical examination.

Michigan has decided advantages for encouraging industrial serology. The Michigan Department of Health Laboratories are well organized and have excellent facilities for the laboratory examination of industrial or group specimens. Official branch laboratories are located throughout the state, the mailing and record procedure is convenient and organized for

prompt and efficient results. The excellent cooperation between the Bureau of Industrial Hygiene and the Division of Venereal Disease Control[1] of the Michigan Department of Health has done much to stimulate the program throughout the industrial areas of Michigan. Other encouraging factors include the rapid expansion of preplacement and periodic medical examinations in industry, and the increasingly receptive attitude on the part of management and labor for the detection of syphilis in the industrial worker.

In our surveys, each industry is studied to determine the comprehensiveness of its medical program. In many cases it was found that routine blood tests were often omitted from medical examinations because these are considered an awkward and time-consuming operation. This is particularly true in those industries experiencing rapid personnel expansion which results in the overloading of medical facilities. It was also found that blood tests were frequently omitted in industries employing part-time physicians whose time is limited and scheduled. These and other difficulties have been a decided handicap in our promotional efforts. It is apparent that many of these difficulties can be overcome by improved methods of blood extraction.

The problem was approached by a detailed study of blood extracting techniques which have found limited or general use. These blood extracting methods included the drip method, the Keidel tube method, the Luer syringe method and a method known in Michigan as the "Selective Service Bleeding Kit."[2] The first techniques are not found in general use in Michigan for group blood testing. The Luer syringe is used extensively, while the "Selective Service Bleeding Kit" is used almost exclusively by the Michigan Selective Service Examining Boards. The objections to the drip method are too obvious for consideration. The Keidel tube, based on the evacuated container principle, has the advantage of speed and simplicity of operation, but has not found general favor because of the expense involved in group testing and the difficulties encountered at the laboratory in the removal of the blood clot from the container.

The accepted method of blood extraction in industry is the Luer syringe with detachable needle. The technique of this method has been observed in detail, since it is believed that the objections to blood testing are in reality objections to the syringe method of blood extraction. Results of this study revealed the following advantages and disadvantages:

Advantages:

A. The Luer syringe is light and maneuverable.

B. It is simple to operate.

Disadvantages:

A. In group testing it is necessary to have as many sterile syringes and needles as patients. At times as many as 50 to 100 patients are examined daily.

(1) Owing to the large number of syringes required, the cost of this one examining procedure is considered excessive by some industries.

(2) Since syringes and barrels are not interchangeable the breakage expense must be taken into consideration.

B. The preparation of syringes and needles is time consuming and a cumbersome procedure.

(1) Proper care of syringes and needles demands immediate washing after use.

C. After blood has been extracted, good practice requires the removal of the needle from the syringe before blood is expelled into vial.

(1) Hemolysis may result in expelling blood into vial requiring another blood test.

(2) Blood spillage is frequent on expulsion into vial.

(3) Observation revealed that blood vials are often overturned during the transfer of blood into vial.

(4) Owing to the transferring and handling necessary with the syringe technique, there is always a possibility of infection or contamination.

From these observations it is evident that a definite need exists for a simple and practical blood extracting technique. This technique should, if possible, retain the advantages of the Luer syringe and eliminate its disadvantages. If this can be accomplished it is believed that it will prove attractive to the industrial physician and, therefore, stimulate the inclusion of the blood test in industrial medical examination programs.

With the cooperation of the Director of the Venereal Disease Control Clinic of the Grand Rapids Health Department,[3] experiments were conducted with old and new blood extracting techniques under actual clinic conditions and routine clinic patients. In this experimental work it was determined that the most efficient method of blood extraction is based on the evacuated container principle. This principle is not an innovation so far as blood extraction is concerned. It has been used in a variety of methods, but as yet these methods have not proved satisfactory for the purpose we had in mind—that of obtaining large numbers of blood specimens with a minimum of effort and expense. The Hemospast was designed for this particular purpose.

In order to overcome the difficulties inherent in transferring blood from one container to another, it was realized that this disadvantage could be eliminated only by drawing blood directly from the vein into the standard blood specimen vial. To incorporate the vacuum principle in the standard blood vial it was first necessary to design a rubber stopper with the following specifications:

A. Retain a vacuum in the blood vial over extended periods of time.

B. Combine low initial cost with re-usability.

C. Allow withdrawal of evacuating needle without loss of vacuum.

The necessity for specifications A and B are self evident. The specification allowing for the withdrawal of the evacuating needle without loss of vacuum may need some explanation. We realized early in our clinic study that all the advantages of an evacuated vial would be of little value if the evacuating procedure was complicated and difficult. It was therefore necessary to provide a simple means of evacuation. It is apparent that the most advantageous method of evacuation was by penetration of the rubber stopper by an evacuating needle. Hence it is essential that the rubber stopper have some self-sealing quality in order to retain a vacuum after the needle is removed.

It was determined that 20 to 30 inches of vacuum is easily retained in the blood vial, which provides the most satisfactory range for blood extraction from the vein. In our first experiments mechanical pumps were used to evacuate the vials but it was soon found that the common, inexpensive, water aspirator pump is ideal for the purpose. This type of pump gives the correct range of vacuum and provides a simple and rapid means of air removal. In addition, it is easily adaptable to any laboratory or clinic. It can be readily attached temporarily or permanently to any sink faucet. A syringe needle is attached to the aspirator of the pump. The needle punctures the cap of the rubber stopper and enters the vial, is held there for a fraction of a second, and is then removed. The method of evacuating the vials is shown in Fig. 1. The average time for evacuating 50 vials is about four minutes.

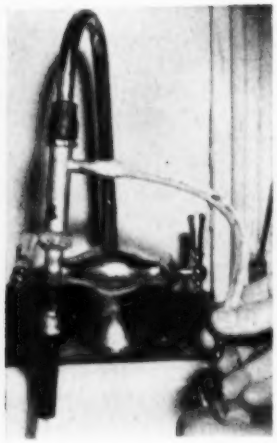

Fig. 1.

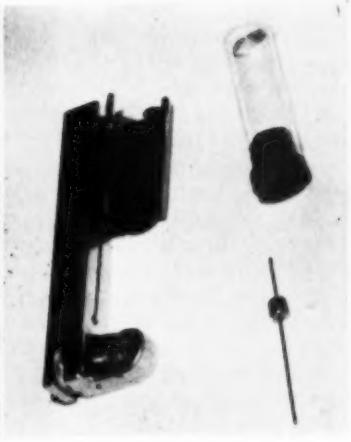

Fig. 2.

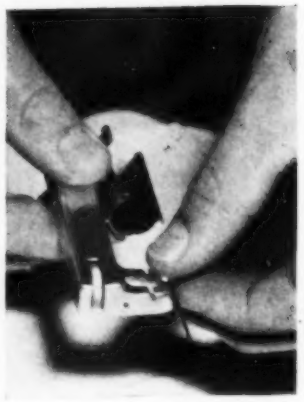

Fig. 3.

Fig. 4.

The development of an instrument for coordinating the use of the standard blood letting needle and vial presented the most difficult problem. Several types of instruments were designed and used in the clinic study. The gradual improvement of these instruments resulted in an instrument called the "Hemospast." Our immediate objective was to develop an instrument that would be as light and maneuverable as the Luer syringe and at the same time retain its ease and simplicity of operation. Other objectives having no relation with the Luer syringe presented themselves as the work progressed. These included the proper fixation of the needle; the alignment of the needle in the proper position; provision for holding the vial in the most advantageous position. It is believed that the "Hemospast" incorporates these features to best advantage, with the main objectives of maneuverability and simplicity of operation.

The technique of operating the "Hemospast" requires no special skill. The instrument is extremely simple, consisting of three parts as shown in Fig. 2. Proficiency with the instrument is acquired after two or three blood extractions. The accompanying illustrations show the operating procedure. The blood letting needle is inserted into the opening provided for it on the instrument (Fig. 3). The needle is then locked in position. An evacuated vial is placed into the holder (Fig. 4). The lumen of the needle is inserted underneath the skin but not into the vein (Fig. 5.) The slide holding the vial is then pushed slightly forward, allowing the lower end of the needle to penetrate the stopper (Fig. 6). The "Hemospast" is now pushed forward to allow the needle to enter the vein. Entry into the vein is immediately detected by the blood flow in the vial (Fig. 7).

When the vial is filled, the needle is withdrawn in the same manner as withdrawing a Luer syringe. The vial, which is now filled and automatically sealed, is removed from the instrument and is ready for labelling and mailing. The needle is removed from the instrument (Fig. 8); another sterile vial and needle are inserted, and the Hemospast is ready for re-use.

On the basis of our experience with the Hemospast technique of blood extraction, and from reports received from those clinics where it has been used; it is believed that the advantages of this method may be summarized as follows:

1. Eliminates the use of the Luer syringe for a more convenient and economical method of blood extraction.
2. Eliminates the expense involved in purchasing a large number of syringes and replacing those broken by handling.
3. Eliminates time-consuming procedures involved in washing, drying and sterilizing syringes.
4. Eliminates the necessity for an assistant in some clinics.
5. Eliminates the transfer of blood from syringe to blood vial and thereby prevents accidental spilling and overturning of specimens.
6. Blood hemolysis occurs less frequently by avoiding transfer of the blood from syringe to vial.
7. Actual clinic experience has shown that the unpleasant psychological effect on the patient is diminished.
8. The time required to take a blood specimen is materially shortened.

The instrument and technique described in this article have been used on more than 5,000 patients during the past six months. This work has been confined to venereal disease control clinics and plant medical departments where large numbers of blood tests are taken daily. The reaction of the patients has been favorable. Physicians and technicians who have used

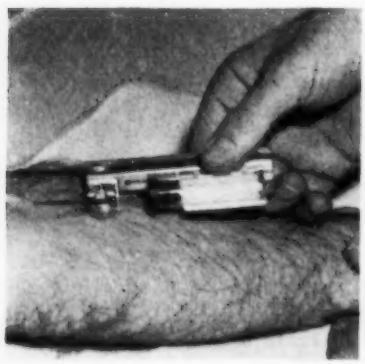

Fig. 5.

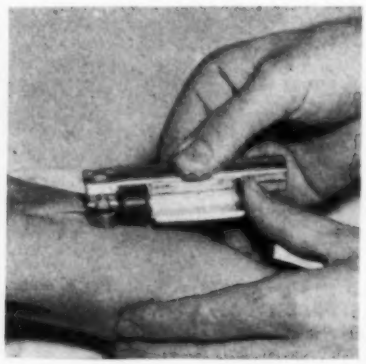

Fig. 6.

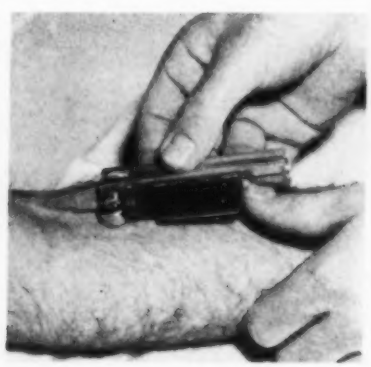

Fig. 7.

Fig. 8.

the method commend its speed, convenience, and simplicity.

It is hoped that the Hemospast technique of blood extraction will prove a worthy contribution to venereal disease control programs, and that it will be of material assistance to all those interested in the promotion of syphilis control.[4]

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1. FRANCIS J. WEBER, M.D., Director, Division of Venereal Disease Control, Michigan Department of Health.
2. Devised by DRS. CUMMINGS and FORSBECK of the Michigan Department of Health.
3. L. W. FAUST, M.D., F.A.C.S.
4. In addition to the cooperation of their official agencies, DRS. FRANCIS J. WEBER and L. W. FAUST gave valuable suggestions and criticisms. MR. GEORGE PALMER KENNEDY, Assistant Plant Manager, Norge Division of Borg Warner Corporation, of Muskegon, Michigan, gave estimable assistance in instrument design and construction. A valuable contribution in the development of the new technique was given by THOMAS F. MANCUSO, M.D., formerly associated with the Bureau of Industrial Hygiene of the Michigan Department of Health. Much credit is also due the clinic and industrial medical department personnel in which the work was done. Their consistent cooperation, encouragement, and practical experience were a calculable contribution in the Hemospast technique.

An Effective Preventive Medical Program

—At an Army-Operated Industrial Plant—

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IN ACCORDANCE with the desire of the War Department that a well balanced and coordinated industrial hygiene program be conducted in army-operated industrial plants,[1] provisions were made in the early part of 1942 for the establishment here of a plan which would not only include the examination of the individual before employment but also provide for a periodic study of the individual while at the job in order to detect the toxic effects of specific explosive compounds. To carry out this program, a careful preemployment examination, including a history, blood Kahn, chest x-ray and complete clinical examination was conducted to classify individuals according to their physical ability to withstand certain health hazards. This part of the program has remained practically unchanged. Special periodic examinations were done regularly on people engaged in exposure operations, for the purpose of detecting the effects of specific compounds on these individuals. The scope of these examinations depended on the nature of the chemicals handled, as, for example, the Webster test was done on operators who were exposed to TNT, and special studies were made of blood smears of those who worked with lead compounds.

In a very short time, it was found that this part of the plan was not applicable to this plant because of the following reasons. First, in some areas of the plant some employees do not remain on one job long enough to permit sufficient examinations and observations to study the effects of specific compounds, although they may be constantly exposed to a series of different compounds. Second, some operations are of such short duration that very little opportunity was afforded for a study of the effects of the working environment on the individual. In a few instances, the individuals were shifted and the operation either terminated or modified just at the time when it was felt that conclusive results were being obtained.

Because these conditions prevented adequate observation and because, in chronic poisoning, months or years may be required before the victim reveals clinical manifestations, it became obvious that it was necessary to modify our method of approach to a better industrial hygiene control.

In September, 1941, Foulger and Fleming[2] described in the literature a system of medical control of industrial exposure to toxic chemicals which could be used to study exposures to chemicals of known toxicity and to detect and follow the activity of new chemicals. The system is based upon the observation that exposure to toxic chemicals causes a change in blood pressure. (The details of this scheme are fully described in the literature.[3]) Foulger's scheme was adopted, and the following plan was put into immediate action in June, 1942:

A complete survey of all operations was made jointly by the medical and safety departments.

Arrangements were made with management and the safety department to notify the medical department whenever any operations were to be modified or changed. Pre-employment examinations were modified so that individuals who qualified could work with all chemicals.

Periodic examinations of employees exposed to toxic chemicals were modified to include the Foulger system of blood pressure rating. A mobile laboratory unit is used because of the large areas covered by the various plant buildings and the distance between the hospital and buildings. Examining employees near their work had gained favor and cooperation from management because of saving of man-hours and transportation.

The operators arrive at the designated first aid stations in groups of three or four, and are furnished with benches so that they do not stand while waiting. They are not allowed to smoke after arriving at the station. Each one sits quietly in the examining chair for at least five minutes while his history is taken. The five-minute period, combined with the preliminary short rest, is regarded as sufficient time for the blood pressure to reach a stable level.

The history consists first of a statement of the patient's chemical exposure, including the specific job, specific chemical, and length of time at the job. He is also given an opportunity to state any symptoms or complaints, and is specifically questioned about those generally considered most significant, such as headaches, dizziness, heaviness on the chest, etc. On the first examination of the individual a brief environmental survey is taken, including diet, amount of sleep and commuting distance (which in many cases amounts to 90 miles daily). The new operator is also questioned on previous illnesses, particularly anemia, gall-bladder and kidney disease, gastric ulcers and rheumatic fever. In compliance with an order of the Ordnance Department,[4] workers found to have constitutional or organic disease, including syphilis treated or not treated, are not allowed to work in toxic exposures.

At the end of the five-minute rest period, the blood pressure is taken on both arms, noting the fourth and fifth phases of diastolic pressure, and the pulse rate determined. Abnormal blood pressures are checked by the second member of the team of two technicians. Individuals showing significant abnormalities of hypo- or hypertension are sent to the hospital to be seen by the industrial medical officer. After the blood pressure reading, a complete blood count is taken, and urine specimen obtained.

Ordinarily, 24 patients are examined each morning. The technicians return to the hospital laboratory, where the blood pressure readings are scored and the specimens examined. After all results have been entered on the charts maintained for each operator, they are sifted by the chief technician, and all ab-

	JULY'42		AUG.		SEPT.		OCT.		NOV.		DEC.		JAN'43		FEB.		MAR.		APR.		MAY		JUNE	
TOTAL EXAMS	4		46		52		41		29		17		81		152		102		78		71		61	
CHR. ABNOR	1		12		11		4		2		0		3		3		5		5		2		5	
ABNOR TOTAL EXAMS	1/4	1/4	20/46	21/50	20/52	41/102	10/41	51/143	3/29	54/172	1/17	55/189	14/81	69/270	25/152	94/422	16/102	110/524	6/78	116/602	4/71	120/673	6/61	126/734
CORR. EXAMS	0/3	0/3	8/34	8/37	9/41	17/78	6/37	23/115	1/27	24/142	1/17	25/159	11/78	36/237	22/149	58/386	11/97	69/485	1/73	70/558	2/69	72/627	1/56	73/683
TOTAL SCORE	1.00	1.00	3.33	3.50	3.33	3.73	2.00	3.64	0.75	3.38	0.33	3.05	1.55	2.87	1.66	2.67	1.45	2.62	0.66	2.47	0.50	2.26	0.86	2.21
CORR. SCORE	0.00	0.00	1.60	1.60	1.80	1.88	1.20	1.92	0.25	1.72	0.33	1.56	1.22	1.71	1.46	1.84	1.10	1.78	0.11	1.55	0.25	1.47	0.14	1.35
CHEMICALS	TNT PENTOLITE		PENTOLITE		TNT		TNT PENTOLITE		TNT TETRYL		TNT PENTOLITE TETRYTOL		TNT TETRYTOL		TNT TETRYL TETRYTOL		TNT TETRYTOL		TNT		TNT TETRYTOL		TNT AMATOL	
WORKING CONDITIONS	VERY POOR WORKING ENVIRONMENT. HEAVY DUST AND SKIN CONTACT. POOR HYGIENE AND HOUSEKEEPING.														DEFINITE IMPROVEMENT IN HOUSEKEEPING. CREAMS AND HANDKERCHIEFS ELIMINATED, BETTER PERSONAL HYGIENE. JOB METHODS IMPROVED.									

Fig. 1. Melt Loading Area

Total Examinations—all examinations that month.
Chronic Abnormals—those operators who had had more than their allowance of abnormal blood pressure findings.
Abnormal Total Examinations—ratio of all abnormals, both chronic and non-chronic, to total examinations.
Corrected Examinations—ratio abnormal non-chronics to total non-chronics.
Total Score—score of non-chronics and chronics combined. Corrected Score—score of non-chronics alone.
The first column of each month indicates the findings for that month, the second column gives the cumulative figures.

normal cases and those showing significant trends are brought to a conference with the industrial medical officer.

In these conferences, cases are handled in the following manner: Individuals found to have an abnormal score, unless caused by disease, malnutrition or unusual exertion, are considered to be possibly affected by chemical exposure. They are removed from the exposure and their blood pressure is examined weekly for three weeks. If, at the end of this period, the individual has a normal score, he is returned to his regular job and examined again after one week of exposure. If he again exhibits an abnormal score, he is removed permanently from the exposure. If the individual reveals abnormal scores on three consecutive weekly examinations after removal from an exposure, he is considered disqualified and assigned to a non-toxic job.

In addition to the scoring of individual operators, each area where toxic exposures exist is scored monthly (see Fig. 1). A cumulative score is carried along with the score for each month. At a conference between the industrial medical officer and the chief technician, each area is scheduled for further examination according to its score.

In general, areas showing normal scores (unity or less) are examined every three months, while those showing scores above one are examined monthly. However, areas handling TNT, DNT, and other substances of known or suspected toxicity are examined monthly, or more frequently if indicated. Fig. 1 illustrates a TNT melt loading area with a persistent score of over one. Figs. 2 and 3 illustrate the differences in score in two areas having obvious differences in exposure. However, it is not always easy to coordinate the score with the amount of apparent exposure in an area.

The monthly area scores are also discussed at a conference between the industrial medical officer and the safety department, and inspections are made to

	JULY'42		AUG.		SEPT.		OCT.		NOV.		DEC.		JAN'43		FEB.		MAR.		APR.		MAY		JUNE	
TOTAL EXAMS	46		60		60		57		56		58		24		11		16		17		31		20	
CHR. ABNOR	8		8		8		4		2		3		0		0		1		0		0		1	
ABNOR TOTAL EXAMS	11/46	11/46	14/60	25/106	11/60	36/166	5/57	41/223	6/56	47/279	4/58	51/337	0/24	51/361	0/11	51/372	3/16	54/388	1/17	55/405	0/31	55/436	6/20	61/456
CORR. EXAMS	3/38	3/38	6/52	9/90	3/52	12/142	1/53	13/195	4/54	17/249	1/55	18/304	0/24	18/328	0/11	18/339	2/15	20/354	1/17	21/371	0/31	21/402	5/19	26/421
TOTAL SCORE	1.83	1.83	2.00	2.27	1.57	2.25	0.71	1.95	0.86	1.88	0.57	1.76	0.00	1.70	0.00	1.64	1.00	1.64	0.33	1.61	0.00	1.53	2.00	1.65
CORR. SCORE	0.60	0.60	1.00	0.90	0.50	0.85	0.14	0.72	0.57	0.77	0.14	0.69	0.00	0.64	0.00	0.62	0.66	0.66	0.33	0.67	0.00	0.64	1.66	0.74
CHEMICALS	TETRYL →																							
WORKING CONDITIONS	ALTHOUGH THERE ARE A FEW HIGH-EXPOSURE JOBS SUCH AS SCREENING AND BLENDING IN GENERAL THIS IS A CLOSED PROCESS WITH VERY LITTLE DUST OR SKIN CONTACT.																							

Fig. 2. Tetryl powder manufacturing area

	JULY'42		AUG.		SEPT.		OCT.		NOV.		DEC.		JAN'43		FEB.		MAR.		APR.		MAY		JUNE	
TOTAL EXAMS	75		93		67		35		34		31		20		22		50		40		33		41	
CHR. ABNOR.	12		23		13		3		4		2		1		0		1		2		1		4	
ABNOR. EXAMS / TOTAL EXAMS	24/75	24/75	31/93	55/168	14/67	69/235	5/35	74/270	5/34	79/304	4/31	33/335	1/20	84/355	0/22	84/377	13/50	97/427	6/40	103/467	1/33	104/500	6/41	110/541
CORR. EXAMS	12/63	12/63	8/70	20/133	1/54	21/187	2/32	23/219	1/30	24/249	2/29	26/278	0/19	26/297	0/22	26/319	12/49	38/368	4/38	42/406	0/32	42/438	2/37	44/475
TOTAL SCORE	2.63	2.63	3.10	3.44	1.75	3.28	1.00	3.08	1.00	3.04	1.00	2.82	0.33	2.80	0.00	2.62	2.16	2.77	1.20	2.71	0.20	2.60	1.20	2.55
CORR. SCORE	1.50	1.50	1.00	1.43	0.14	1.23	0.50	1.15	0.20	1.09	0.50	1.04	0.00	1.00	0.00	0.93	2.00	1.23	0.80	1.24	0.00	1.17	0.40	1.13
CHEMICALS	TETRYL →																							
	MERCURY																							
WORKING CONDITIONS	DEFINITE DUST EXPOSURE WHEN FILLING THE HOPPERS OF PELLETING MACHINES. MARKED AMOUNT OF SKIN EXPOSURE IN HANDLING PELLETS. EXPOSURE TO MERCURY VAPOR CAUSED BY SPILLAGE AND POOR HANDLING OF MERCURY.																							

Fig. 3. Tetryl pellet manufacturing area

discover the cause in areas showing abnormal scores. It will be noted in Fig. 1 that recommendations made following such inspections in this area resulted in an improvement of working conditions which, in turn, resulted in a gradual lowering of an abnormal score.

No correlation can be found between the scores of individuals and their complaints and symptoms. Failure to find such correlation may be influenced by the following conditions:

(a) Individuals showing blood pressure changes are removed from exposure before they can develop other manifestations of toxicity.

(b) Some employees either conceal or falsify symptoms in order to remain on a particular job, or to be removed from an undesirable area.

No appreciable systemic effects have been noticed here, but in the light of occurrences at other plants this cannot be interpreted as meaning that the materials handled are not toxic. It is felt, rather, that at least in some cases possible systemic effects have been forestalled by removing individuals on the indication of an abnormal blood pressure trend.

Conclusions

THE FOULGER system offers a simple and quick method for control of toxic exposure. This system requires little equipment and causes no discomfort to the employee. It is of definite value in indicating areas where excessive exposure may exist.

In plants where operations are often modified and chemicals frequently changed, the Foulger system serves as an index of non-specific toxic absorption where it would be impossible to follow the effects of specific chemicals by specific tests.

Summary

THE PHYSIOLOGICAL effects of specific chemicals on individuals could not be followed because of rapid personnel transfers and frequent operational changes.

2. Using the Foulger system, excessive toxic exposures have been discovered through abnormal scores. These discoveries led to improvements in the working environment and manufacturing methods.

3. Systemic effects have been avoided by removing individuals developing abnormal blood pressure scores.

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Petroleum Solvents and Trichlorethylene

—Part 3 of the Literature Study of Reports of Occupational Diseases Attributed to Volatile Solvents—

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THE CASE STUDY of petroleum distillates covers only inhalation cases resulting from use of the products as solvents, as has been true of the chemicals covered previously in this literature study. It therefore excludes such cases as may have occurred through ingestion of gasoline, kerosene, naphtha, etc., both in and outside of industry. A case reported by Johnstone (Occupational Diseases, 1942, pp. 92-6) of a worker who attempted to syphon gasoline by mouth from an automobile tank in order to use it as a solvent was considered in this category, as was a similar case reported by Sachs and Egan (*Nebraska Med. J.*, April, 1943, pp. 114-5).

As stated in the preceding installments, the aim has been to present all American cases reported in the medical literature that have occurred during the last 10 years. For this reason, several cases which were reported by Hayhurst in 1936, but had occurred prior to the period of this study, have been excluded.

A number of cases in the literature are attributed to mixtures of petroleum distillates with carbon tetrachloride. These cases were included in the carbon tetrachloride study (*Indust. Med.*, December, 1943), and, therefore, are not repeated here. There are eight such instances reported by: Shirley (*Rubber Age*, December 10, 1932, p. 166); Poindexter and Greene (*J.A.M.A.*, June 16, 1934, pp. 2015-7); Davis (*J.A.M.A.*, September 29, 1934, p. 964); Davis and Hanelin (*Indust. Med.*, January, 1937, pp. 24-5); Trumper (*Indust. Med.*, April, 1941, p. 152); Johnstone (Occupational Diseases, 1942, pp. 108-11); and *Illinois Labor Bulletin* (May 31, 1942).

As to the trichlorethylene cases, also included in this installment, it will be noted that there are no cases

AMERICAN CASES OF OCCUPATIONAL EXPOSURE TO PETROLEUM SOLVENTS IN THE MEDICAL LITERATURE SINCE 1932

Year	Circumstances	Chemical	Degree of Exposure	Length of Exposure	Ventilation	Early Symptoms
*1931	Workers in shingle staining operations in one plant	Vehicle ⅓ petroleum naphtha, ⅔ kerosene (4% creosote added for darker stains)	Hands and arms nearly to elbows were soaked in mixture, and vapors directly inhaled		Large workroom, but no artificial ventilation, room ventilation by windows and a door on one side only	
	Case 1. Shingle stainer, 31, submerging wood shingles by hand in tank of shingle stain			11 months to first symptoms; 13 months to examination		Diarrhea, numbness attacks, vertigo, gastric disturbances weakness, loss of weight (170 to 130 pounds)
	Case 2. Shingle stainer, 51, (father-in-law of above)			Periods totalling about 8 months		Constant skin itching, occasional rashes, nervousness
	Case 3. Worker, 27, (son of above)—character of work not stated		Same as above?	1½ years first time; 4½ months second time (about a year in other work in between)		Insomnia, nervousness, pruritis parethesia (first time)
	Case 4. Brusher, 29		"Exposure had been chiefly to the inhalation of vapors"	2 years		"Weakness, gastric cramps, eye strain, vertigo, insomnia, constant headache, cramps in legs, dental caries, very nervous and anorexia"
*1932	7 workers, cleaning metal trays preparatory to enameling	Petroleum naphtha	Trays were dipped in can containing several gallons of the naphtha, then scrubbed and dried		"Closed room without ventilation"	
	Case 1. Female "washer," 20		Scrubbed trays in can	5 weeks		Smarting eyes, burning throat, drowsiness, loss of appetite headache, nausea, tired feeling, nervousness, family physician reported "that she lost her mental faculties after a few days and remained so until he was dismissed from the case"
	Cases 2 to 6. Females, ages not stated		Wiped and stacked trays after they were washed	Not stated		Similar symptoms but "not so marked"
	Case 7. Male "washer," 19		Same as Case 1	2 weeks		"Similar symptoms which became so marked that he was compelled to give up the work"
*1932	Male, 27, rubber worker, preparing dry rubber stock	Benzine (high test gasoline)	Not stated	5 years	Not stated	Bleeding from nose and gums, headache, dizziness, numbness of hands and feet, weakness, loss of weight, weak pulse
*1933	Oil refinery employee, male, 26, "subjected to distillates escaping from petroleum stills"	Petroleum distillates	Was called to "trouble" points, "where the distillates were naturally more prevalent"	4 years, "more exposure last 2 years"	Not stated; "stills were under cover"	Lethargy, some embarrassment of respiration, some loss of capacity for prolonged mental application, muscular twitchings, some throat irritation, "along with enlargement of glands at various times"
*1933	Female, 41, "building" rubber tubes by moistening ends with benzine soaked sponge	"Mixture of hydrocarbon-oils similar to naphtha"	Handled swab dampened with the gasoline for period of about 2 seconds each minute	2 months; previously employed 1 year at "flipping" tires	Room "very spacious, with windows opened on 2 sides"	Weakness, dryness of nose and throat, dry cough, nausea, loss of weight, drowsiness, some bleeding from nose and throat
*1933	Female, 39, "flipping" beads in rubber tire factory (taking wrinkles out of beads)	Benzine	Not stated	3 years	Not stated	Weakness, dryness of nose and throat, dry cough, anorexia, nausea, tired feeling, bleeding from nose and gums, nervousness, drowsiness, headache, dyspnea, loss of weight
*1933	Female, 20, washing parts of household appliances in electrical manufacturing company	Naphtha	"Noticeable saturation of the air with naphtha fumes"	1 month	Room not provided with windows, "had only one air duct"; local health officer reported "A fair amount of ventilation"	Dizziness, fainting, anorexia, nausea
*1934	Female, 24, painting automobile tire covers with "valspar" (lacquer dissolved in petroleum distillates of higher boiling point than gasoline)	Petroleum distillates	Not stated	8 years	Windows closed. Drying oven in same room	Bleeding of gums, constipation, weakness, swelling of face and hands, headache, anorexia

*Date of first medical examination; otherwise year report published.

AMERICAN CASES OF OCCUPATIONAL EXPOSURE TO PETROLEUM SOLVENTS IN THE MEDICAL LITERATURE SINCE 1932

Later Symptoms	Length of Illness	Consequences	Reported By	Remarks
			HAYHURST, E. R., Indust. Med., Feb., 1936, pp. 57-59	
Cardiac disturbances, neurasthenia, paresthesia, increased respiration, "syncopal attacks on all work efforts"	Apparently received compensation for 14 months	(Oct. 1933) "Patient has been slumping for the past several weeks." Radiologist reported "considerable fine infiltration of lungs which looks mightily suspicious of beginning tuberculosis"; expectoration, however, reported negative for tuberculosis		Patient reported that "other employees at the same plant were similarly annoyed"
Pruritis, low macular dermatitis on arms, neurasthenia	Apparently on compensation for about 1 year	Not stated		
Sleeplessness, chronic headache, pain in eyes, loss of appetite, constipation, nervousness	Apparently still receiving compensation 3 years later	See "length of illness"		Brother, about 33, in shingle staining process for about a year presented "the same complaints . . . he is still so employed"
Reflexes moderately exaggerated, diarrhea, tender abdomen, loss of weight reported by patient "from 155 to 134 pounds"	Still unable to work 2 years later	Not stated		
			HAYHURST, E. R., Indust. Med., Feb., 1936, pp. 59-60	
Loss of weight from 158 to 65 pounds, insomnia, extreme nervousness, mentality "somewhat affected," marked bowels, marked anorexia, occasional vomiting of mucus, and other symptoms	"Began to mend rapidly" after about 14 months	Recovered		
Not stated	No lost time reported	See "length of illness"		
Not stated	2 months	"Eventually recovered and returned to work at another job in same factory"		"The job in question—washing trays in naphtha—was discontinued when this young man (case 7) became disabled"
Persistent nosebleed, loss of weight from a claimed 147 to 121 pounds, anorexia, anemia, heart rapid and irregular	Not stated	Not stated	HAYHURST, E. R., Indust. Med., Feb., 1936, p. 61	
Loss of weight from 148 to 132 pounds, "occasional cough accompanied with pain and rarely a little red tinged expectoration . . . difficulty in walking," basal metabolism was minus 24, later minus 16, palpitation on slight exertion	6 or more months of treatment	Not stated, "case will be watched with interest"	HAYHURST, E. R., Indust. Med., Feb., 1936, pp. 60-1	"Apparently some other employees had mild symptoms of poisoning"
Anemia	Not stated	Not stated	HAYHURST, E. R., Indust. Med., Feb., 1936, p. 61	Operation had been in effect 5 years with no other reported cases
"Appeared somewhat anemic . . . nauseated . . . little appetite . . . nervous and drowsy, headaches and dizziness"	Not stated	Not stated	HAYHURST, E. R., Indust. Med., Feb., 1936, p. 62	
"Marked injection of the pharyngomucosa was noted," conjuctivae red	Not stated	Not stated	HAYHURST, E. R., Indust. Med.	Reporting physician said at time he saw patient "a number of other girls were carried out unconscious from the plant"
Convulsive seizure, subfebrile periods, some photophobia, pain in back of head and neck, nosebleed, insomnia, stiffness of joints, pelvic tenderness, loss of weight	Incapacitated for 2 years; after 4½ years, still had "night epilepsy"	Not stated	HAYHURST, E. R., "Proc. 8th Internat. Congr. for 'Accident Medicine' and Industrial Diseases," Leipzig, Sept., 1938, pp. 1180-2	

AMERICAN CASES OF OCCUPATIONAL EXPOSURE TO PETROLEUM SOLVENTS IN THE MEDICAL LITERATURE SINCE 1932

Year	Circumstances	Chemical	Degree of Exposure	Length of Exposure	Ventilation	Early Symptoms
1936	Tailor, 56, and wife, 47, pressing gasoline cleaned clothes in small apartment	Gasoline	Not stated	12 years	Not stated	Not stated
*1938	Dry cleaner removing clothing from "churners"	Stoddard's solvent	Exposed to fumes from 3 churners daily	3 months	"With exception of a large electric fan, there was no special apparatus for ventilation and purification of air"	Dermatitis, nausea, gastric discomfort
1941	52 painters in spray painting operations	Gasoline varying in aromatic content (toluene and xylene) from 1 to 30% with an average of 5 to 10%	300 to 800 p. p. m. (representative aromatic hydrocarbon concentrations)	Not stated	Workmen protected with cartridge type respirators	Vertigo, nausea, vomiting, anorexia, weakness, headache, malaise
1942	Worker, removing grease, in engine room of yacht	Gasoline	"Room reeked of gasoline," bottle containing gasoline found broken	Not stated	"Rather small, confined space"	"Found on the floor of the engine-room in a stupor"
1942	Maid, cleaning wearing apparel with naphtha	Naphtha	Not stated	"Cleaned several articles"	"Doors and windows were closed"	"Found on floor bleeding from a laceration of the posterior scalp"

AMERICAN CASES OF OCCUPATIONAL EXPOSURE TO TRICHLORETHYLENE IN THE MEDICAL LITERATURE SINCE 1932

1937	Three males, ages 25, 42, 38, degreasing small metal objects in 2-dip immersion degreasing machine	Trichlorethylene	Not stated		"Operating instructions given by manufacturer (of machine) were not followed"	
				Case 1. 14 months		Loss of 20 pounds in weight, nausea, headache, lethargy, and similar subjective symptoms, complete loss of consciousness 4 times while at work, conjunctivae injected, fine tremor of eyelids and hands
				Case 2. 12 months		Increased fatigue, with weak spells, palpitation, dizziness, tremor of eyelids, tongue and hands, loss of consciousness several times, corneal reflex diminished, pharyngeal reflex absent, conjunctivae injected
				Case 3. 13 months		Increased fatigue, palpitation, headache, tremor, corneal reflex diminished, pharyngeal reflex absent, conjunctivae injected, gums spongy
1937	Man, removing clothes by hand from drum-like machine, after "Tri" had been drained from a hopper below	Trichlorethylene	Removal of clothes, requiring 3 to 4 minutes, repeated 50-60 times per day. Also filters cleaned by hand every 2 days	14 months	"Small room (about 8x10 feet) with one door and window." Window kept closed, door open. In room where filters were cleaned, exhaust fan, which worked from the floor, was kept in constant operation	Loss of vision
1937	Worker, 28, degreasing	Trichlorethylene	Not stated; open-top unit—"not equipped with suitable acid-proof flues"	5 days	Not stated	Headache, nausea, "drunken" feeling, "wheezing in the throat"

*Date of first medical examination; otherwise year report published.

AMERICAN CASES OF OCCUPATIONAL EXPOSURE TO PETROLEUM SOLVENTS IN THE MEDICAL LITERATURE SINCE 1932

Later Symptoms	Length of Illness	Consequences	Reported By	Remarks
Man — Slight inflammation of pharynx, moderately enlarged heart, slight arteriosclerosis, petechial hemorrhages in lower extremities, slurred speech, peripheral nerve pain, mentally confused, disoriented and irrational	Not stated	"Survives in extremely deteriorated condition"	LEMERE, F., Colo. Med., June, 1936, pp. 409-11	
Wife—2 "strokes," with loss of consciousness, paling of optic discs, paralysis of third cranial nerve, hyperesthesia of extremities, slurred speech, hyper-active reflexes, jerking movements of extremities and head, "extremely confused and disoriented . . ."	2 months in hospital	Died		
Subacute yellow atrophy of liver, painless jaundice, muscular weakness, albuminuria, glycosuria, anemia, "general toxemia affecting principally the liver and, in addition, the blood, kidneys, pancreas, gastro-intestinal tract and muscular system"	Approximately 1 month	Recovered	BRAUNSTEIN, L. E., *J.A.M.A.*, Vol. 114, Jan. 13, 1940, pp. 136-8	
Mental depression, inability for sustained attention and activity; "significant decrease in hemoglobin, erythrocyte and cell volume values, with an increase in mean corpuscular hemoglobin, mean corpuscular volume, and reticulocyte count"	Not stated	Not stated	STERNER, J. H., J. Indust. Hyg. and Tox., Nov., 1941, pp. 437-47	Situation corrected by requiring, for all inside maintenance spray painting, the wearing of an air-supplied respirator, modified by addition of a charcoal cartridge absorber, so that when air-line supply is broken the wearer automatically breathes through the cartridge
"Severe frontal headache and smarting of his eyes . . . he alleged headache and dizziness"	Compensation paid for 5 weeks	Recovered	JOHNSTONE, R. T., "Occupational Diseases," pp. 96-7	
None	The head injury disabled her for 3 weeks	Recovered	JOHNSTONE, R. T., "Occupational Diseases," p. 97	Author states: "In the absence of any other cause, the fact that the patient was leaning over naphtha in a confined room was accepted as sufficient evidence of naphtha intoxication"

AMERICAN CASES OF OCCUPATIONAL EXPOSURE TO TRICHLORETHYLENE IN THE MEDICAL LITERATURE SINCE 1932

			N. Y. State Indust. Hyg. Bul., Nov., 1937	
Not stated	Not stated	Not stated		
Not stated	Not stated	Not stated		From 1922 to 1930 worked with surgical sutures involving exposure to acetone, ether, xylol, alcohol, hydrochloric acid, and mercuric chloride
Not stated	Not stated	Not stated		A fourth case of "possible trichlorethylene intoxication" in a different industry is mentioned. Employee refused to submit to physical examination but said he felt drowsy, sluggish and vision had become impaired
Toxic amblyopia, "moderate blepharitis with crusting at base of cilia, and slight hypermia of conjunctivae"	Not stated	Permanent blindness, apparently	McNALLY, W. D., Indust. Med., Oct., 1937, p. 541 (quoting personal communication from "Reese of Johns Hopkins hospital")	
Marked dyspnea, coarse mucous rales, tenderness over liver, enlargement of blind spo*	Not stated	Recovered	McNALLY, W. D., Indust. Med., Oct., 1937, p. 542	Case reported by author as due to phosgene poisoning from decomposition products of trichlorethylene. Patient stated that "one fellow worker went to sleep on the floor . . . while another was absent from work for two days"

AMERICAN CASES OF OCCUPATIONAL EXPOSURE TO TRICHLORETHYLENE IN THE MEDICAL LITERATURE SINCE 1932

Year	Circumstances	Chemical	Degree of Exposure	Length of Exposure	Ventilation	Early Symptoms
1938	Man, 26, degreasing	Trichlorethylene	Not stated; open tank	1 year	Not stated	"Became unconscious on several occasions," lack of feeling in hands and feet
1938	Man, 27, cleaning furniture	Trichlorethylene	Not stated	2 years	Not stated	Pains in right lung (x-ray of chest negative)
1938	Young man, in degreasing job, apparently	Trichlorethylene	Not stated	Not stated	Not stated	"Severe eye disturbances"
1942	Negro cleaning machinery parts in large tank of chlorethylene	Trichlorethylene	"Worked over tank of solvent"	2½ hours	"Poor"	Dizziness, drunken behavior, "fell over on to the floor unconscious"
1943	2 persons in degreasing operations	Trichlorethylene	Not stated	Not stated	Not stated	Not stated; "very little, if any, narcosis"

*Date of first medical examination; otherwise year report published.

prior to 1937. While the medical literature was searched for the 10-year period, as in the case of the other solvents included in this study, no American cases prior to 1937 could be found.

Ultra-Violet Radiation

— In the Treatment of Dermatitis Due to Cutting Oil —

MOREY PARKES, M.D.,
Curtiss Wright Corporation,
Propeller Division,
Caldwell, New Jersey

DERMATITIS, particularly of the pustular variety, is very common in those workers who have to handle cutting oil. Despite all precautions, these cases will occur.

We have tried many treatments, and have found the following to be the most satisfactory.

The patient is first given thorough instruction in the value of hygiene and frequent washing of the arms and hands while working. In cases where there is marked comedo formation, another soap, known as "septicide soap," is used. This is one of the most effective preparations we have seen for the removal of "blackheads." The patient is then given the following prescription to be applied after each washing:

Castor Oil	30%
Lanolin	70%
Dupinol	2%

He is told to come into the medical department every day for an ultra-violet treatment. An erythema dose is produced just short of a first degree burn. This is continued for about one week until the condition has cleared. After the ultra-violet treatment, the affected parts are soaked in a proprietary Burrow's solution known as Domeboro's. After soaking the hands and the arms for 20 minutes, he is given the following prescription:

Aluminum subacetate	1%
Zinc oxide	7%
Talc	
Petrolatum	100%

Additional Domeboro tablets are dispensed for use in soaking at home. This treatment has cleared up 90% of these cases in about one week. Wherever possible, we try to arrange for a transfer from the cutting oil if a recurrence develops.

SUMMARY: (1) The value of ultra-violet radiation in the treatment of oil dermatitis is discussed. (2) Supplementary measures are outlined for the treatment of this condition.

Conduct of a First Aid Room

—In a Small Plant—

STANLEY SPRAGUE, M.D.,
Medical Director, J. & P. Coats (R. I.) Inc.,
Pawtucket, Rhode Island

THE location of any first aid room or rooms should be on the ground floor, centrally situated as regards the various departments or sections of the plant, with separate entrance and exit doors.

The size of a first aid room, of course, will depend on the number of employees, and the type of hazards experienced, but the area should be sufficient to divide into a waiting room for those seeking treatment and then an actual treatment room or rooms. There is a definite improvement in the psychology of treating patients, especially in industry, and the permitting of one patient to view the injuries of another is not a good practice.

The lighting of these rooms should be preferably by daylight but, if artificial light is necessary, it should be either of the concealed or fluorescent type. Special lights, where concentration of greater than normal light would be necessary, should be provided, namely, as for removal of small particles from eyes, splinters from fingers, etc.

The floor should be smooth and covered with some non-dusty, easily cleanable and, if possible, waterproof covering.

One special lavatory and toilet should be provided for the personnel of the first aid room, and a second similar room should be provided for use by patients. At least one or two wash-basins should be supplied, which can be utilized, with their running water, as immersion vessels for hands and arms. At least one foot tub for the care of injuries to the lower extremities should be provided.

A first aid room should be quiet and well insulated from external mill noises and vibrations, if possible. The walls should be of a neutral shade, as light ivory, or one of the pastel shades, these being preferable to clear white. All windows should be protected by both black and white shades, and all glass painted with some translucent material, the privacy to the patient being a great psychological factor.

One or two couches or hospital beds should be provided, which can serve not only for rest but, if the proper height, also for the performance of some minor operations.

It would seem needless to say that immaculate cleanliness of walls, windows, floors, linens, dressing tables,

Presented at a meeting of the RHODE ISLAND SOCIETY OF INDUSTRIAL PHYSICIANS AND SURGEONS, November 16, 1943.

AMERICAN CASES OF OCCUPATIONAL EXPOSURE TO TRICHLORETHYLENE IN THE MEDICAL LITERATURE SINCE 1932

Later Symptoms	Length of Illness	Consequences	Reported By	Remarks
"Well developed case of multiple neuritis"	4 weeks to date of report	Not stated	McNALLY, W. D., Indust. Med., June, 1938, p. 298	
Gastric ulcer	Pains in lung "have persisted for 5 months"	Not stated	McNALLY, W. D., Indust. Med., June, 1938, p. 298	
Not stated	"Forced to stop work for several weeks"	"Returned to work, but not on a degreasing job"	McNALLY, W. D., Indust. Med., June, 1938, p. 298	
Vomiting, severe headache, epigastric pain, profuse perspiration	3 days	Recovered	JOHNSTONE, R. T., "Occupational Diseases," 1942, p. 138	
Not stated	"The fatal issues appeared suddenly about 1 hour after the end of the 8-hour work period"	Both died	N. Y. State Indust. Hyg. Bul., March, 1943, p. 125	Article states: "Complete details of the cases will be published in the near future"

cabinets, etc., is imperative, as well as the immaculateness of the personnel—fresh, clean uniforms and neatness in personal appearance.

The reception of each injured person has a tremendous bearing on the confidence engendered in the victim of an accident—a personal interest, not only on the first visit but likewise on every redressing, is necessary.

Keep the equipment of first aid rooms down to as little as is absolutely necessary; the more stuff that accumulates the more there is to clean and dust.

A supply of good, cold drinking water should be made available, as well as hot water for the making of hot drinks, and for the usual soaking of injured parts.

Promptness in attendance to patients, even to the making of definite appointments for redressings, is very essential in order that no time will be unnecessarily lost by the worker coming from and returning to a department.

Each first aid room should be equipped with sufficient blankets and a stretcher for immediate emergency use.

The use of safety posters is of value, provided they are well chosen and there are not too many visible at one time; also, these posters should be changed with a frequency of not less than two to three weeks.

Accommodations for the comfort of the personnel of the first aid room itself are important in assisting to keep up the morale of the nurse or nurses or other attendants in charge.

A card, showing the basic features of the workmen's compensation act, should be posted in every first aid room for the information and guidance of every case.

In those plants which have a regular physician making visits at regular times, a choice of outside physicians rarely comes up as a subject, but it should be understood definitely, in this state, by the personnel in charge of the first aid room that every person has the privilege of calling or seeing his or her own personal physician at any time. It is rare that any coercion to use the plant physician is needful. I say this advisedly after 20 years' experience in handling ill and injured workers.

The nurse in charge should be prompt in her hours of duty; she should endeavor to maintain a pleasant, sympathetic attitude, and be able to encourage the victim of an accident or illness by her cheerfulness and efficiency. She can give, by her attitude, additional confidence to the victim as he is received and treated.

Her activities in the line of treatment must be confined strictly to those for which she is employed and, in my opinion, no nurse has a right to criticise the treatment received by a patient, given by either the patient's own or the plant physician.

Further, the nurse must be encouraged to stay within the bounds of her profession, which means that serious lacerations, etc., are to be seen by the plant physician and if, in his opinion, treatment can be safely left to the nurse's discretion he, naturally, absorbs the responsibility.

Finally, the keeping of many and varied types of medicines for the treatment of this, that and something else is to be discouraged. A first aid room should treat only the most simple of ailments, and the others referred to the doctor. In this particular field, I feel that every person complaining of illness, who applies to the plant physician for advice, should be given such advice and immediately referred to his or her personal physician, with either a telephone call to him or a note given to the patient. In this way, I feel that ethics are upheld, and that good feeling between industrial and personal physicians is maintained.

Oral Cold Vaccines

IN A CURRENT questionnaire survey regarding the use of oral catarrhal vaccines in protecting industrial workers against the common cold—with particular emphasis on their effectiveness, if any, in reducing absenteeism due to colds—the reports from industrial physicians so using them reveal, at this time, the following percentages:

Favorable	25.0%
No difference	10.5%
Distinct benefit ("Very satisfactory," etc.)	10.0%
50% effective	8.5%
Experimental stage (First year) ("Too early to know")	7.0%
75 to 80% effective	6.0%
Less colds, of shorter duration	4.0%
60% effective	4.0%
Reduces absenteeism	3.5%
Moderately good	3.5%
Some improvement	3.5%
Very little absenteeism among workers participating	1.5%
Satisfactory to doubtful	1.5%
Hard to evaluate	1.5%
25% effective	1.5%
Employees ask for them	1.0%
12 to 15% effective reduction	1.0%
10% reduction	1.0%
85 to 90% effective	1.0%
Satisfactory—("3% out with colds compared with 30% year before")	.5%
Skeptical—first year, no records	.5%
Prescribe in practice	.5%
Employees have confidence in their efficacy	.5%
About 25% as effective as intradermal	.5%
Lost no time due to colds, used several seasons	.5%
Formulated no opinion, but have been using them	.5%
No effect on virus colds	.5%
"Not worth a damn"—"worthless"—"no good"	.5%

Industrial Medicine
Reg. U. S. Pat. Off.

The Journal of
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AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS
28th Annual Meeting, St. Louis, Missouri, May 8-12, 1944.

Congress on Industrial Health

THE A.M.A. Council on Industrial Health, in announcing the Sixth Annual Congress on Industrial Health, to be held in Chicago, February 15 and 16, emphasizes its recognition of two areas, as it were, of more inertia than is good for the good health of "industrial health" as the Council interprets it. Both areas are in the direction of education; one the education of the medical student, the other the education of management. The Congress dates are timed for the sessions to begin at the conclusion of the Annual Congress on Medical Education and Licensure, and thus the deans of medical schools and others interested in medical education will, at least, be exposed to the possibility of learning something about the field of medical practice which is now asking to be admitted to the curriculum. And the Congress will attempt to attract greater attention from management and labor—in the interest not only of the war effort, but also the maintenance after the war of the steady forward progress of recent years. The program will feature the important and timely subjects of most direct significance at this time, while underlying the presentations will be the increasing recognition on the part of the medical profession as a whole that industrial health offers a highly useful avenue for the distribution of valuable medical services. The Council is to be commended "clear across the board"—for (1) the tactful invitation to the deans, and (2) the alert recognition of the strong forces which labor and management represent in the whole ensemble of industrial health. It is hoped that no effective publicity will be overlooked; the attendance ought to be as satisfactory to the Council as its own appreciation of its opportunity is to everyone else who has the best interests of industrial health at heart.

"Relatively Non-Toxic"

CASES attributed to petroleum solvents and to trichlorethylene (pages 46-51) constitute the third installment in the series of case studies by Safety Research Institute. Preceding installments have been devoted to benzol and carbon tetrachloride cases.

Perusal of the events attributed to the various solvents covered in this study leads to some interesting conclusions.

The cases in the current issue, for instance, were caused by solvents which are generally considered "relatively non-toxic." Of course, the number of cases reported is small when considered in relation to the wide use of the products. Yet the fact remains that, given the right circumstances, injuries could and did occur. And, of course, it is not unlikely that investigators may have overlooked these solvents as possible causes of illness in other cases, because they are not generally regarded as hazardous to health.

Another interesting point is the similarity of circumstances which resulted in injuries, regardless of the solvents used. Small, poorly ventilated places, "hand" operations, inadequate controls both of operating equipment and ventilating conditions seem almost inevitably to result in trouble.

It becomes evident that those responsible for the health of workers cannot rest on the assumption that any solvent is non-injurious. The solution is to encourage provision of proper controls by management and use of those controls by workers.

Medicine and Health

THE *British Medical Journal*, in connection with its announcement of the new *British Journal of Industrial Medicine* (page 14), more or less defines the field, bringing within the scope of *Industrial Medicine* all the "whole range of problems" which, in this country, are being associated with medical considerations under the gentle euphemism of "industrial health." These problems face the worker, the management, and the physician, and none involves less than all three. The "health" is the aim, but the "medicine" has to be applied whatever the problem, so long as the physical or mental condition of the worker is a factor in his economic status, the trend being almost universally toward a more individualized relation between the worker and the circumstances and environment of his work. The term "industrial health," therefore, is a good one to emphasize to management the expediency of developing and maintaining situations that will tend to make the medicine unnecessary. Meanwhile, however, the workers and the innumerable problems of their conditions, reactions, needs and susceptibilities will keep the physician busy for a long time to come—since the health which is the goal for all can never be attained by each, and the "medicine" will always have to be applied.

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Shortens their course in some instances
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SULMEFRIN decreases congestion by the vasoconstrictor action of *dl*-desoxyephedrine hydrochloride, thus assisting the antibacterial action of sodium sulfathiazole. The vasoconstrictor is also believed to facilitate the sulfonamide in reaching the deeper layers of the nasal mucous membrane.

The mild alkalinity of Sulmefrin (pH approx. 9.0) is preferable according to Turnbull et al[1] for nasal medication because (1) the sulfonamide has the greatest bacterial action in the pH range from 8 to 10, and (2) because it allows ciliary action to continue for a long period of time.

Sulmefrin may be administered by spray, drops, or tamponage.

* "Sulmefrin" (Reg. U. S. Pat. Off.) is a trademark of E. R. Squibb & Sons.

[1] *J. A. M. A.* 123:536, Oct. 30, 1943.

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Hygiene: Medicine: Industrial Relations

—Abstracts of Papers presented at the Eighth Annual Meeting of the Industrial Hygiene Foundation of America, Inc., Pittsburgh, November 10-11, 1943—

Reported by

C. O. SAPPINGTON, M.D., Dr.P.H.

CHARACTERIZED by the highest attendance in the history of the Foundation, the Eighth Annual Meeting, held at the Mellon Institute, Pittsburgh, November 10-11, 1943, was packed full of information with respect to engineering, hygiene, medicine, and personnel relations for industrial staffs.

The keynote address was given by MR. CHARLES F. KETTERING on the subject "Maintain Manpower," and was followed by a panel discussion on "Putting the Veteran Back to Work." Reports were presented as usual by the Medical, Engineering and Legal Sections on the most recent developments with respect to health hazards, disability, control of health hazards, survey results, and legal developments in 1943. An industrial relations session on the Maintenance of Womanpower and Manpower in Industry included discussion of "Health Problems of Women in Industry," "Health Problems of the Older Employee and Employer," and "Reducing Manpower Losses."

The Foundation

MR. ANDREW FLETCHER welcomed the delegates and briefly commented on the reasons why the Foundation was started and why it should continue; its financial position; and how it can help its members and the war program.

1. *Why was the Foundation founded, and why should it continue?*

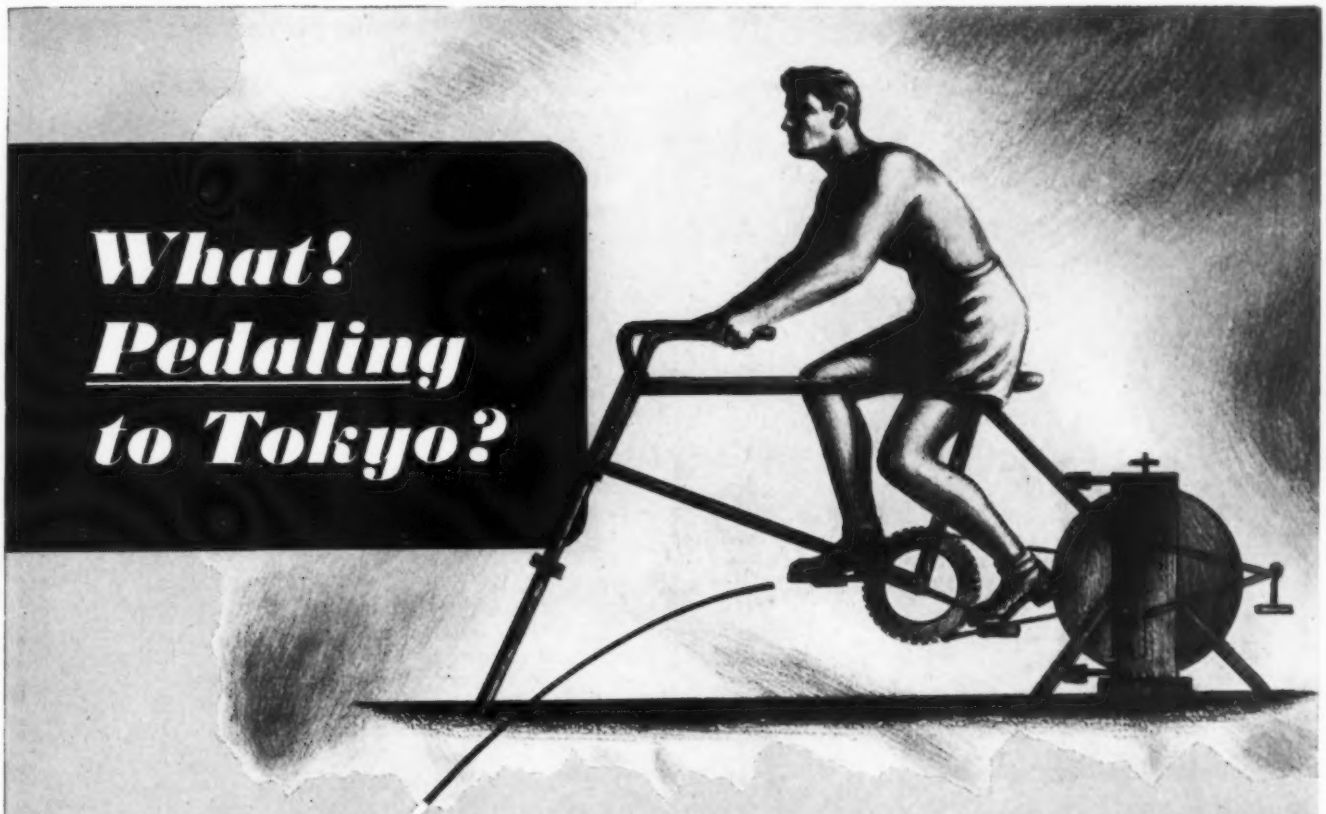
About 10 years ago our country was in the depths of a great depression, and, owing to the resultant unemployment, various claims for occupational diseases, such as silicosis, were widespread. Companies quickly realized that it was difficult to obtain any competent information as to whether the claims were justified; and they also awakened to the realization that they had little, if any, data upon which to fight unjust claims. More important still, if it was found that an occupational hazard did exist, there was no one central place where suggestions could be obtained to lessen the hazard. In the 10 years which have passed great strides have been made, owing to the knowledge acquired through adversity; the most important development being, in the speaker's opinion, the acceptance by industry of the fact that improved working and living conditions result in lower costs—the dollars spent in these improvements paying enormous dividends.

In the eight years since the Foundation was founded it has progressed from a struggling and poorly financed group to one of the strongest organizations of its kind in the United States, and one which represents the interests of the employee as well as those of the employer by helping to prevent illness and occupational diseases through research in the plant as well as in the laboratory, and by the practical collection and dissemination of industrial hygiene data. Just as he can now foresee the greatest era of industrial activity this country has ever enjoyed when the war has been won—as there is no doubt it will be—the speaker stated he has always believed in the necessity for an organization, such as the Foundation, where unbiased information and help can be readily and inexpensively obtained. The Foundation can be especially helpful in the postwar period, when the protection of the health of employees, and possibly even of the consuming public, will be even more important than in the past, as, with the enormous advances in chemistry and engineering during the war, unknown hazards have arisen in the development of new products.

2. *The financial position of the Foundation.*

There is a great deal of truth in the old saying that nothing succeeds like success—the success of the Founda-

What! Pedaling to Tokyo?



YES—the man on this bicycle ergometer is speeding us to Tokyo.

The work he does, the fatigue he endures, can be measured accurately. Such measurements enable us to increase war production efficiency.

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**Barborka, C. J.; Foltz, E. E., and Ivy, A. C.: Relationship Between Vitamin B Complex Intake and Work Output in Trained Subjects, J. A. M. A. 122: 717-720, July 10, 1943.

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tion, and the insistence of the Board of Trustees that expenditures should at all times be budgeted and supervised, have resulted in a strong financial position.

3. *How the Foundation can help its members and the war program.*

The speaker closed with the suggestion that, as the greatest present domestic problem is manpower, the members let the Foundation aid them by making practical proposals for the lessening of industrial hazards. Although the staff is somewhat limited, the Foundation can handle even more plant surveys in 1944 than were handled in 1943.

MR. JOHN MCMAHON commented on the Foundation's most successful year, saying that 24 more companies had been added to the membership list. A financial statement was presented, and the survey work by two full-time specialists was described, this having resulted in a saving of materials, money, and manpower, as well as improvement in labor relationships.

Industrial hygiene has come to be a definite working force in industrial relations, and this has been especially noticed in the Foundation's work during the past year.

The monthly *Industrial Hygiene Digest* published by the Foundation has become an important factor in the dissemination of information; incidentally, the estimated cost by an outside agency was placed at $1500 a year. Comments were also made on the other publications of the Foundation. In closing, MR. MCMAHON paid a tribute to DR. MELLER as a pioneer who brought science to the study of air pollution.

"Maintain Manpower"

DR. E. R. WEIDLEIN, of the Mellon Institute, welcomed the guests and members, and introduced the keynoter, MR. CHARLES F. KETTERING.

MR. KETTERING'S subject was "Maintain Manpower."

The scientist might be defined as one who does not know what he is doing—the main thing is to start. He must get to where things function automatically. So far a good job has been done on materials, and now we have the problem of doing a good job with men.

Medical organizations have set up safeguards against the misuse of information and, in this respect in our present conditions, new products, materials and operations, and shifts in routines have confused many in industry.

How far industrial hygiene can or should go is at present unanswerable. In the experience at Dayton with dental clinics, the result was a great deal more routine work for practicing dentists in the community, because of developing the habit of periodic check-ups. Clinics should be made attractive, so that people will want to go and spend some leisure time in them. The speaker expressed a preference for having a doctor look at him for five minutes rather than to have to wait for him for 45 minutes.

After taking care of chemical hazards in any plant, the employees should be encouraged to go to their own physicians and become health-conscious. Much remains to be done along this line.

Some of the principal points are as follows: (1) the control of the common cold is one of the important problems in maintaining manpower; (2) war experience will contribute much in respect of maintaining manpower; (3) of great interest are the man-hours of intelligent application with respect to our various problems; (4) it is one thing to fail and another thing to fail intelligently—we must use methods of cutting and trying—models and experiments should not be destroyed—we must find out why they do not work.

It is most important to achieve certain objectives, even if some of the elements are not well understood—they will follow. This has been illustrated many times in research and its application.

A well laid-out program, with facilities for today, will do much to save manpower, man-hours and suffering, because of the control of the working environment and assistance to the individual physician in his work. This represents the greatest effort in the world, and combines a real research program plus the social welfare of the community. "Godspeed you and your work."

Putting the Veteran Back to Work

DR. C. D. SELBY, in presiding at the panel discussion on "Putting the Veteran Back to Work," introduced the panel members and stated that there was considerable agitation over this subject in industry. It is important that industrial experiences be related and discussed, particularly the adaptation of the employees who are able to work on the jobs which are available.

COL. JOHN N. ANDREWS described the functions of the Re-employment Division of the Selective Service System, and discussed the subject "Demobilization, Rehabilitation and Re-employment of Veterans."

To protect the re-employment rights of returning veterans, and in keeping with the mandate in the Act of 1940, the Director of Selective Service has established the Re-employment Division. This division is charged with the responsibility of replacing in former positions, or aid-

Program

Wednesday Morning, November 10

THE FOUNDATION Reports to its Members—ANDREW FLETCHER, Vice-President, St. Joseph Lead Company, Chairman, Foundation's Board of Trustees, and JOHN F. MCMAHON, Managing Director.

"Maintain Manpower" (Keynote Address)—CHARLES F. KETTERING, Vice-President, General Motors Corporation.

Panel Discussion

CLARENCE D. SELBY, M.D., Medical Consultant, General Motors Corporation, and Member of the Foundation's Board of Trustees and Medical Committee, presiding:

"Putting the Veteran Back to Work" (Panel Discussion)—COL. JOHN N. ANDREWS, Executive Officer, Re-Employment Division, National Selective Service System; HARLEY L. KRIEGER, M.D., Medical Director, Ford Motor Company; A. A. HENDRIX, Personnel Director, Eastern Aircraft Division, General Motors Corporation; and I. DENT JENKINS, Personnel Manager, Harrison Radiator Division, General Motors Corporation.

Wednesday Afternoon, November 10

ROYD R. SAYERS, M.D., Director, U. S. Bureau of Mines, and Member of the Foundation's Board of Trustees and Medical Committee, presiding:

"How the Inhalation of Some Chemicals Affects the Eye"—CHARLES F. KUTSCHER, M.D., Medical Adviser, Industrial Hygiene Foundation.

"Recent Data on Health Hazards in War Industries"—LT. COL. W. J. MCCONNELL, M.C., Safety and Security Branch, U.S. Army; SURGEON R. H. FLINN, M.D., U. S. Public Health Service, Safety and Security Branch, U. S. Army; and LT. COL. RAYMOND HUSSEY, M.C., Director, U. S. Army Industrial Hygiene Laboratory.

"Fluorides as an Industrial Health Problem"—ROBERT A. KEHOE, M.D., Director, and EDWARD J. LARGENT, Kettering Laboratory, University of Cincinnati.

"Further Observations on Lung Changes in Electric Arc Welders"—O. A. SANDER, M.D., Medical Committee, Industrial Hygiene Foundation.

"Progress Report on a Study of Disability in Silicotics" (A Foundation-Supported Study)—L. U. GARDNER, M.D., Director, and GEORGE WRIGHT, M.D., The Saranac Laboratory.

Thursday Morning, November 11

MAINTENANCE of Woman- and Man-Power in Industry—E. W. KEMPTON, Asst. Vice-President, Industrial Relations Dept., U. S. Steel Corporation of Delaware, presiding:

"Health Problems of Women in Industry" (Findings from a Foundation-Supported Plant-to-Plant Study)—C. O. SAPPINGTON, M.D., DR. P.H., Industrial Health Consultant, Chicago.

Discussion—MRS. WARWICK B. HOBART, Adviser on Employment of Women, Office of Secretary of War.

"Health Problems of the Older Employee and Employer"—EDWARD J. STIEGLITZ, M.D., Washington, D. C.

"Reducing Manpower Losses" (Including Results of a Foundation–U. S. Public Health Service Study)—W. M. GAFAFER, D.Sc., Principal Statistician, U. S. Public Health Service.

Engineering Section

PHILIP DRINKER, Harvard School of Public Health, and Chairman, Foundation's Engineering Committee, presiding:

"Control of Health Hazards in Shipbuilding, Including Welding"—PHILIP DRINKER, Chief Health Consultant, U. S. Maritime Commission.

"Report on Highpoints of Foundation Plant Surveys"—FRANCIS R. HOLDEN, PH.D., and W. C. L. HEMEON, M.S., Industrial Hygiene Foundation.

Thursday Afternoon, November 11

ENGINEERING Section (continued)—"Exposure of Men to Heat"—LT. COL. T. H. HATCH, S.C., Armored Medical Research Laboratory, Fort Knox, Kentucky.

"Application of Engineering Control Measures in Munitions Plants"—ALLEN D. BRANDT, D.Sc., Sanitary Engineer, U. S. Public Health Service; Safety and Security Branch, U. S. Army.

Legal Section

PRESIDING, T. C. WATERS, of Mullikin, Stockbridge & Waters, Baltimore; Chairman, Foundation's Legal Committee:

"Legal Developments in 1943 Respecting Industrial Health"—T. C. WATERS.

"Medical Testimony in Compensation Cases"—J. DEWEY DORSETT, Assistant General Manager, Association of Casualty and Surety Executives.

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ing in securing new positions for, those persons satisfactorily completing service in the armed forces.

Under Section 8 of the Selective Training and Service Act of 1940, as amended, returning veterans must be returned to their old jobs or similar ones of like pay and seniority status provided they desire such positions and the following conditions exist: (1) that the position the veteran left was not a temporary one or that he was not a temporary employee; (2) that he makes application for re-employment within 40 days after he is relieved from active service with the armed forces; (3) that he receives a certificate of satisfactory service—honorable discharge; (4) that he is still qualified to perform his previous work; and (5) that his reinstatement will not work an undue hardship on the employer.

It is encouraging to observe that of the thousands of veterans already released from active service (over 600,000 since September 16, 1940), practically all of those entitled to re-employment in their old jobs and desiring such reinstatement have been reinstated wihout delay. Employers generally have made liberal interpretations of the Act and have done everything possible to carry out their obligations. Where veterans, for various reasons, could not be reinstated in their old jobs, employers have made every effort to adjust them to other jobs in their plants or have helped them find other work opportunities. In only one case has it been necessary to refer a case to the U. S. District Attorney, and, in this instance, when the employer was informed that the papers were being prepared for trial, he agreed to reinstate the worker and paid $648 in back wages.

Organized labor has been equally cooperative in helping adjust problems of seniority, wages, union dues, and other factors involved in restoring veterans to their former jobs, and in assisting them in securing new work opportunities. There is every reason to believe that this same cooperative spirit will continue.

Turning now to the program of the Re-employment Division of the Selective Service System, it is highly decentralized and operations are essentially at the local level. Two or more re-employment committeemen have been appointed and are attached to each of the 6500 local boards. These men are volunteers and, like local board members, serve without compensation. They serve as the friends and advisers of returning service men. Re-employment committeemen attached to the local boards must maintain personal contact with the local representatives of the several agencies which are established to serve the returning veterans. These agencies and their functions are as follows:

1. The Veterans' Administration adjudicates pension claims of all honorably discharged persons who were in active military or naval service after December 7, 1941, and prior to the termination of the war. It also provides, in service-connected disabilities, hospitalization, if necessary, and domiciliary care, disability pensions, and vocational rehabilitation of all types, such as shop, commerce, university, etc., cooperating in eventual placement with the U. S. Employment Service.

2. The U. S. Employment Service, operating as a part of the War Manpower Commission, assists in the placement of all workers and attempts to channel them into essential industry.

3. The Veterans' Employment Service, as a part of the U. S. Employment Service, is responsible for handling the employment interests of all veterans registered with the Employment Service.

4. The Office of Vocational Rehabilitation of the Federal Security Agency is responsible for vocational training in nonservice-connected cases. It will assist in the training and educating of those men and women who desire to learn a trade or profession before entering or re-entering a civilian occupation, and who do not come under the jurisdiction of the Veterans' Administration. Its services are available to veterans and non-veterans alike.

5. The American Red Cross assists veterans and their

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families in solving their personal and family problems, and is prepared to help process the necessary papers involved in presenting claims to the Veterans' Administration.

6. The Civil Service Commission supervises the appointment to certain Federal positions and administers the provisions relating to veterans' preference in Federal employment.

7. The U. S. Armed Forces Institute, Madison, Wisconsin, provides records of courses taken by military personnel while in service. These records, at the request of the veterans, can be made available to educational institutions, employers and other properly interested agencies.

In demobilization and rehabilitation, education should receive important consideration. After the war is won, if large numbers of veterans can be induced to continue their education, two important results will be obtained: first the men will be given vital additional education which was interrupted by the war, and, second, this number will be withdrawn temporarily from the labor market. But the leaders in education will be confronted with the most challenging demand in their history. They will be called upon to provide vital education in a concentrated form. Many of the returning veterans will be glad of the opportunity to return to school, but they will certainly demand that the schooling be important and practical. They will also have reason to insist that a maximum amount of subject matter be made available to them in a minimum of time.

In conclusion, it may be said that the task of demobilizing that portion of the 11,000,000 or more men and women in the service who are to be released at the end of the war will not be easy. It will be as difficult as has been the problem of mobilization. The situation will be complicated by the possible rapid demobilization of the 20,000,000 or more war workers, many of whom will no longer be needed in the plants and will be released to seek other employment. However, if careful attention is given in advance to planning for an orderly demobilization, and if the people of the nation can be educated now to the need for the systematic and orderly demobilization of war workers as well as returning veterans, the severity of the problem can be substantially lessened.

DR. HARLEY L. KRIEGER, the next panel speaker, discussed "Putting the Disabled Veteran Back to Work."

The Ford Motor Company in the past has consistently endeavored to hire a cross section of the community, "taking on," roughly speaking, 10% of its employees from disabled workers. In some communities this percentage is higher, in others lower. These disabled workers, in the vast majority of cases, cause no trouble either from a compensation angle, the quality of their workmanship or the quantity of their production. It is the company's impression that these men, knowing their disabilities, are less liable to accidents than normal workers because they will not take chances.

The company is endeavoring to handle the rehabilitation of the returned soldier just as it would handle the employment and placing of any handicapped employee. In order to do this the returned soldiers, with medical discharges, have been divided into two groups: (1) inactive—those who have not been overseas, and (2) active—those who have seen overseas duty. In the inactive group, many of the medical discharges, in fact the majority, are for common, ordinary, everyday disabilities that do not amount to very much in the realm of industry, but yet take on a grave aspect so far as the armed forces are concerned. Sunstroke, sinus infection, asthma, hydrocele, ruptured left ear drum, etc., are all examples of specific diagnoses in group 1. The placing of these discharged men back at work in industry is no trouble. This group is easy to handle and can be readily placed.

The soldiers returned from overseas duty (group 2) are usually discharged with a definite disability, quite frequently permanent. These are the men the government has spent time and money in training, the men who have seen active service. They have been wounded and have stayed in hospitals until their wounds have healed, and

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they now present themselves for work. Jobs must be found for one-armed men, for one-legged men, for one-eye men and for men who have recovered from tropical diseases, from serious infectious diseases and from almost everything that afflicts a soldier. These returned soldiers are just like those in group 1, only their disability is more definite. They, also, are handled by the Medical Transfer, only in their instance it may take several days to locate a suitable job.

The workings of this department, the Medical Transfer, are a great help to the Ford Motor Company. There are 10 people assigned to this department. Two men and one woman are classified as plant investigators, and it is their duty to roam about the plant looking for special jobs available for handicapped employees. There are three men at the front desk whose duty is to listen to complaints, make notes and, later in the day, group these complaints into buildings and assign investigators. Two people do the typing, filing, and keeping the "live files" up to date. One man is assigned to handle compensation cases only, and one man is in charge. It is to be noted here that all of the above personnel have ability far beyond the ordinary run in the art of persuading a foreman to take a handicapped individual. Also assigned to the Medical Transfer are a plant physician and sufficient nurses and first aid men to handle the pre-employment examinations that the Medical Transfer department may request.

In the case of a former employee, one who has been handicapped and is returning to work, he is given a letter to his previous foreman asking "if he can use." If the answer is yes, then that former employee is placed on his old job and goes to work. If the answer is no, then it becomes necessary for the Medical Transfer department to locate a suitable job. The prospective employee and the investigator now get together. The investigator, having at his fingertips almost all of the available jobs, can soon take this man to a department that has the type of work he can best do, and in a short time he is working.

Card index data of all physically handicapped are on file; and a card index of all departments, giving a brief description of the department, location, foreman, operation performed, type of work, stock handled and types of employees preferred, is now being completed. This index is invaluable. In a moment's time one can check department, say, K-906, and know if they need grinders, drill presses or polishers, etc., the weight of the stock handled, and what is available for handicapped workers. In many cases non-productive hands are transferred to productive jobs, as acquaintance with shop work improves, and ambitions dictate. On the other hand, many old timers, some of them heart cases, request special non-production work, sometimes even asking for, and getting, five-day week, eight-hour day jobs.

That the plant physician become thoroughly acquainted with the jobs under his supervision is insisted upon. This necessitates that the doctor travel around the plant, accompanied by a safety inspector. In this manner he can acquaint himself, from personal knowledge, with the type of work in the various buildings.

In summary, the problem of rehabilitating the returned soldier solves itself by the company's regular policy of hiring and placing handicapped workers. A department designated as Medical Transfer is set up and maintained specifically to handle handicapped individuals. This department is vital and its personnel must be carefully chosen.

MR. I. DENT JENKINS continued the panel discussion with a development of experiences in his division in the General Motors Corporation.

An important point in the successful placement of returning veterans is a high degree of flexibility in job grouping and a large number of occupations. One must consider lowered physical status in a so-called tight labor market.

Case histories were related in detail, including hernia, dermatitis, lung trouble, defective vision, and others, which were placed in restricted types of employment.

Most important in MR. JENKIN'S presentation was an allusion to a survey made of all industrial operations with reference to physical requirements—a check sheet has been worked out on this principle and has been found to be of great value. Moreover, the physical requirements have been put on punch cards, which enables a rapid evaluation of jobs open for certain types of disability.

The whole approach of this program has been made on a sound business basis and from a practical manufacturing and a practical medical point of view.

MR. A. A. HENDRIX discussed experiences in aircraft work.

The program has now been in effect for three months and has the cooperation of various groups, the employment department, the medical department, and the supervision and educational divisions. There have been 375 persons returned to work, and now working.

Case histories were given with respect to pneumonia, amnesia, gastric disorders, paralysis of left eye and arm, multiple shrapnel wounds and concussion, and malaria.

MR. HENDRIX placed the rehabilitated persons in two groups: (1) misfits who have had no combat service and have never fitted any place; and (2) those who adjust reasonably well, although they are disabled.

The plan includes a director, an individual psychiatrist, and others who may be necessary, and embraces the following functions: (1) a survey of service men as to age, rank, period of service, etc.; (2) case studies of individuals; (3) a big task involving placement as to health, capacity and training ability; (4) preliminary classification of all jobs; (5) classification of major defects in the disabled groups; (6) a study of the disorders of the nervous system; and finally (7) a study of individuals as to action and inaction.

In conclusion, it must be emphasized that one must deal with the whole man, and that the problem is a coordinative job for all divisions. Some indiivduals will require personality re-synthesis. The misfits must not be permitted to stigmatize the others. It is the belief of all who have been in this work that a real job can be done.

Chemicals and the Eye

IN THE absence of DR. CHARLES F. KUTSCHER, DR. FRANCIS R. HOLDEN read the paper on "How the Inhalation of Some Chemicals Affects the Eye."

The three avenues through which chemicals inimical to the welfare of the host gain access to the body are the skin, the respiratory system and the gastro-intestinal system. Many chemicals are able to use all portals of entry, while to a few only a specific channel affords transmission. Certain chemicals, unless transmitted by a specific channel, lose their toxic qualities, but once admitted to the blood stream the chemical is then carried to all parts of the body.

Although the eye may be affected in many ways by toxic chemicals, the concern, for the moment, is only with those types of injuries resulting from inhaled chemicals. The eye has bundles of delicate nerve fibrils surrounding an artery and a vein, with the whole contained in an unyielding canal. Running through this portion of the nerve there is an interlacing mesh-work of dense fibrous bands. Certain chemicals, such as lead, methanol, etc., are capable of initiating an inflammation within the optic nerve. As these inflammatory products are poured out from the blood vessels they occupy a position between adjacent nerve fibrils (small fiber), producing a pressure on these fibrils. Since the nerve is contained in an unyielding canal there is no way for the pressure to be equalized, hence the full effect of the pressure is exerted against those delicate nerve structures, causing their death. The number of nerve fibrils that are destroyed depends entirely upon the amount and the duration of pressure. Long continued pressure is as damaging as sudden pressure. There is no way of adaptation within the nerve for a new environment. Once these nerve fibrils are destroyed they are never regenerated. Optic atrophy is a permanent affair. All medical and surgical aids are of absolutely no avail. The ciliary circulation feeds the middle coat of the eyeball, which includes the iris, ciliary

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body and choroid. In response to irritation these parts pour out inflammatory material which, on organization, may partially or completely destroy the eye, leading to shrinkage of the eyeball.

In general, the eyeball's reaction to toxic agents is not specific for a certain type of noxious substance. Optic neuritis, for instance, is the same, regardless of the type of the irritating agent. True it is that the severity of the reaction may vary with the type of origin. Toxic agents acting through the blood stream affect the eye structures in one or more of the following ways:

1. Diminishing the blood supply. Certain chemicals produce a spastic effect upon the blood vessel, thus diminishing the blood-carrying capacity of the vessel.

2. Direct toxic action. Upon leaving the blood stream the chemical may directly attack the nerve cell, producing a solution of some vital chemical within the cell, or it may form a new compound which will alter the cell's capacity to function.

3. Indirect toxic action. The eyeball is a very highly differentiated organ, designed primarily for the reception and transmission of visual impulses. More adequately to carry out this function, the elaborate distribution of defenses has had to be curtailed. Hence inflammation once started frequently has a fatal termination so far as seeing is concerned.

In dealing with compounds whose toxicology is not thoroughly understood, considerable care must be exercised in their handling. The first complaint of any visual disturbances on the part of the patient should be immediately followed by a thorough clinical investigation of the employee, and the ophthalmologist informed regarding the chemical nature of the suspected substance. While these investigations are being carried out, thorough plant hygiene must be instituted.

Data on Health Hazards

LIEUT. COL. W. J. MCCONNELL, SURGEON R. H. FLINN, and LIEUT. COL. RAYMOND HUSSEY discussed "Recent Data on Health Hazards in War Industries."

LIEUT. COL. MCCONNELL spoke in part as follows:

In speaking of industrial health and hygiene problems in war industries, much of what can be said applies to industry in general, as nearly all industrial plants have been affected by some fundamental changes in machinery, processes, and materials. Under the pressure of the war, an ever increasing use of new chemicals and the reappearance of old ones, many more toxic than the ones they have replaced, have created a problem of serious magnitude. The war likewise is increasing the number of inexperienced workers and those of advanced age who have long been unemployed. Old standards of physical fitness for employment have had to give way to a more realistic approach in the matter of putting the physically substandard applicant to work.

Industrial absenteeism, under war conditions, has become alarmingly high and, at times, has seriously interrupted the production of greatly needed material. The causes are many; these vary from plant to plant and from industry to industry, and any attempt to apply a single formula to the problem as a whole is futile. Sickness, either physical or emotional, accidents, and excessive fatigue no doubt account for a large percentage of cases of absenteeism, but overcrowding in the plant, frustration caused by green authority, and the migration of workers, particularly from the country to the city, and the associated changes in working, home, transportation, and community conditions contribute in no small measure to loss of production hours.

Accumulated evidence, however, points to sickness as the most frequent single cause for absence from work. Although the truly occupational diseases account for only a small percentage of the total cases of illness, they are tremendously important in particular types of work, and their incidence in many industries has never been so great as at the present time. However, their early recognition, and the improvements in methods of controlling harmful exposures have greatly diminished their seriousness. In a number of operations, the industrial dermatoses far exceed the definite occupational intoxications. Skin contact with materials, such as tetryl, TNT, DNT, fulminate of mercury and others, may cause a sensitization dermatitis, while substances like ammonium nitrate, antimony sulfide, and an ever increasing variety of solvents act as skin irritants.

More serious than the dermatoses, however, are the occupational intoxications from exposures to toxic dusts, fumes, gases or vapors, which, unless adequately controlled, may reach unsafe atmospheric concentrations. Among the more common offenders in Ordnance establishments which must be guarded against are trinitrotoluene and dinitrotoluene, either alone or in combination with other explosive materials in the form of a dust, fume or vapor, depending upon the particular operation; the nitrogen oxide gases; and new explosive compounds, the composition of which cannot be disclosed at this time. Also encountered in certain of these plants are operations giving rise to some of the more familiar atmospheric contaminants. To mention only a few, carbon monoxide may be found during ballistics testing; lead fumes or dust also may be encountered in testing and in other operations, as lead bullet casting, lead melting, burning, pouring and soldering; mercury vapors in mercury crack testing; metal fumes of all kinds in metallizing operations; and vapors of a variety of volatile solvents in degreasing, decarbonizing, and paint spraying operations. While all of these present special problems, accumulated experience from various sources over a period of years has indicated the approach to the solution of controlling these hazards in most instances. Experimental work being carried on in some of our munitions plants is providing the answer in other instances.

Appraisals of occupational health hazards in these plants, as in all Army-owned plants, are made by experienced personnel of the Army Industrial Hygiene Laboratory, and of the Division of Industrial Hygiene of the National Institute of Health, and management is informed regarding necessary measures for correcting existing hazards, and for improving health services.

The medical department of each plant is adequately staffed and equipped to carry out an industrial health and hygiene program best suited to the needs of each facility. Recognizing that prevention is a cardinal principle for lowering the incidence of disability, whether through accident or disease, it is an essential requirement that pre-placement physical examinations be made on all applicants for employment. This is necessary for protecting the worker from engaging in work for which he is physically or mentally ill-adapted and which might result in serious impairment of his health. If, on the other hand, his defects are detected and evaluated, he can be placed in a job that involves no further risk, and may be expected to continue employment as a useful productive workman. Periodic physical examinations, when they can be done, are, of course, well worth while, but, under present circumstances, they usually must be limited to certain groups who are exposed to toxic substances.

The diagnosis and treatment of minor ailments of employees who are ambulatory and working, as well as special diagnostic procedures of those whose work involves exposure to toxic substances and chemical hazards, are essential functions of the medical department. A good industrial health and hygiene program provides also for medical supervision of plant hygiene and sanitation; for immunization of workers against those communicable diseases which are preventable; for supervision of the plant cafeteria; for a planned program of employer health and safety education; and for the maintenance of accurate individual sick records in such a form that they can be easily tabulated and studied in an effort to detect and control excessive illness.

Special procedures applicable to workers engaged in areas where there is an exposure to certain toxic material must be rigidly enforced for their protection. An entire change of clean work clothes, including undergarments, should be furnished these particular workers. Showers at the end of the shift should be mandatory. Special soaps have been developed which effectively remove such substances as TNT and tetryl, and are recommended for use. Detector solutions should be applied to the skin surfaces

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†The Dermatergoses or Occupational Affections of the Skin, White, R. Prosser, 4th Ed., p. 22, H. K. Lewis & Co., Ltd., London 1934.
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on occasions to determine if these substances are being adequately removed. Suitable protective clothing, such as gloves, sleeves, aprons, and respirators, should be furnished to workers on jobs where such protective measures are indicated. Protective ointments may be indicated for the face, neck, and hands of workers in certain substances.

Wherever management has actively supported a comprehensive health program and enforced rules regarding employee self-protection, the occupational dermatoses and intoxications among workers are comparatively few, and lost time from these and other illnesses is minimized.

DR. R. H. FLINN discussed another phase of the subject entitled "Results of an Active Health Program in Munitions Industries."

Generally speaking, the new Ordnance plants have an industrial hygiene program and medical facilities and services second to none. Most of these features are adaptable to American industry generally.

To begin with, new employees going into "powder" plants receive a careful physical examination, so they may be placed at work they can do safely and efficiently. Workers with constitutional diseases likely to be aggravated by exposures to dusts such as TNT are not required to work in such exposures. This, along with other precautionary measures, impresses the worker with the fact that his state of health and physical capabilities are being considered before employing him, and does much toward allaying the nervousness and apprehension often associated with going into this type of work.

Likewise, if the new worker is found to have some disease or defect that may be corrected or controlled, he is referred to his physician for attention and advice. Many cases of early tuberculosis, latent syphilis, elevated blood pressure, and related disorders are detected by this procedure, and put under medical supervision.

The periodic physical check-up and careful medical supervision have been found to be of inestimable value in controlling occupational diseases. For example, in shell and bomb loading plants, where our most serious occupation disease hazards exist, the following figures were obtained as to the prevalence of TNT poisoning in the first 93,000 man-years of operations. There were only eight deaths from TNT poisoning, and 241 cases of TNT intoxication sufficiently serious to lose time from work. This extremely favorable record is in sharp contrast to the experience in the last war, when it was reported that in 7½ months there were 475 deaths out of about 17,000 cases of TNT poisoning, according to the International Labour Office in "Occupation and Health." This lack of many serious cases reflects the splendid work done by physicians in detecting early cases before the onset of disability and also the benefits derived from fairly close attention to personal hygiene, and some improvement in measures for engineering control as compared to 1917-18.

On the other hand, during this same period in the present war, there were reported over 5000 cases with symptoms suggestive of early TNT poisoning, which resulted in the need to transfer about 375 workers a month away from TNT exposure because of the probability of developing disabling, or possibly fatal, illness.

This fairly large number of early cases showing some signs or symptoms of TNT poisoning and the wasteful number of transferrals indicates that many workers have been exposed to excessive concentrations of TNT dust and fumes, and that much further emphasis should be placed upon more adequate engineering control of these exposures, and more stringent supervision of personal hygiene. It is believed that this situation is being largely corrected at the present time.

It has also been observed that the health program functions better in large plants when the industrial physician tours all operations at frequent intervals. Here he learns to know the employees at work and the nature of their jobs, to observe sanitary and hygienic provisions and practices or their lack, and to detect any unwholesome working conditions in the plant. He can fulfill his job as the plant's health officer no better by remaining in his office than can the safety engineer or production superintendent.

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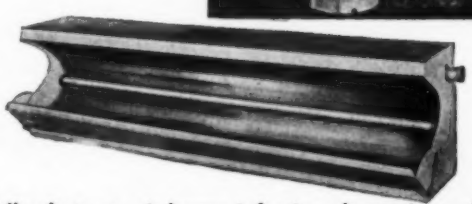

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We have found one important item overlooked with unfortunate results in a few of the plants, and that is the matter of obtaining friendly cooperation between the plant physicians and the private physicians in the community. It is apparent that you cannot put a wall around the plant so far as medical and sanitary problems are concerned. Obviously the employees look to their private physicians for advice on medical matters during the daily 16 hours away from their job. If the worker wishes to change or quit jobs because he thinks his work is hurting his health, or if he wishes a certificate of availability under the War Manpower Commission regulations, he may seek to obtain a doctor's certificate for removal from his job. If the private physicians are wholly unfamiliar with the plant processes and health hazards, they may be in a real quandary as to the truth of the matter when their patients allege the work is injuring their health, and present real or fancied symptoms to prove their contention. In order to prevent a resulting high labor turnover from such situations, we have been emphasizing the necessity of the plant physician establishing close cooperation with private doctors in the community. They are encouraged to visit the plant, observe the operations, discuss the nature and methods of control of occupational diseases in the plant, and consult with the plant doctors regarding troublesome cases. This is a practice that could well be adopted generally.

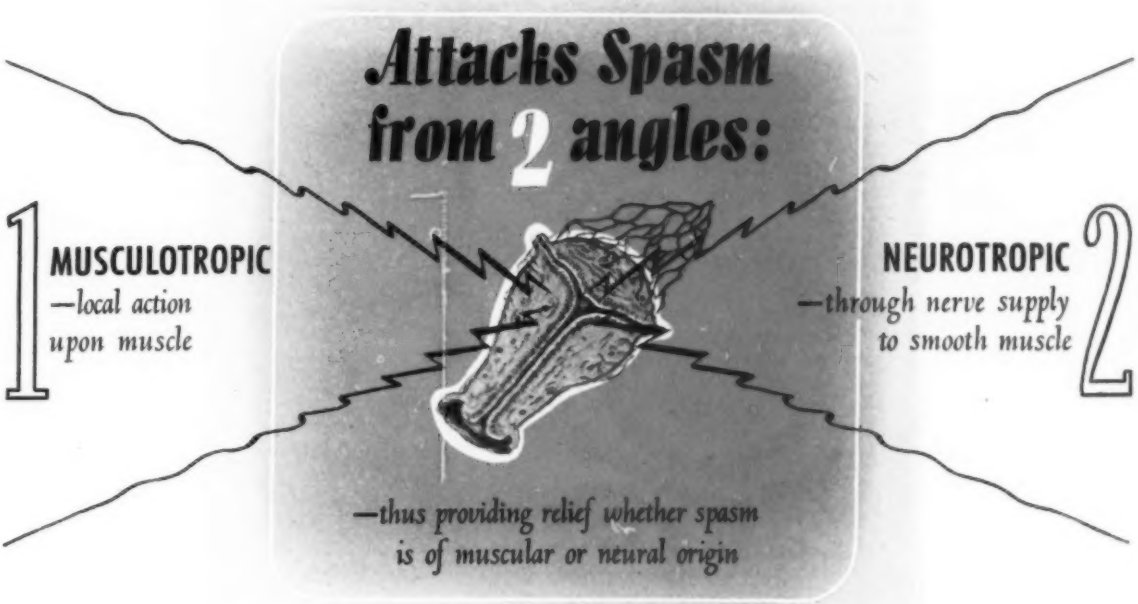
Very considerable progress has been made in the proper and safe placement of physically handicapped workers. No longer is the one-eyed, one-legged, deaf, or blind worker prohibited from doing productive work. Also men with elevated blood pressure, hernia, heart murmurs, varicose veins and related conditions are being placed at work they can do safely and efficiently, under medical supervision when so indicated. It is an adopted procedure to employ workers with syphilis in other than toxic exposures, providing they take the necessary treatment, and have no infectious or disabling complications. Many of our plants now have a rejection rate of less than 1% of all applicants, and are finding, as has been shown before, that, as a group, the physically handicapped employees work more faithfully and productively than physically grade A employees. It is thought that this fact will play an important role in postwar personnel policies.

The promotion of efficiency by the prevention of excessive, disabling fatigue is an important result of the industrial hygiene services. All important plant fatigue producing factors are considered in a well-balanced industrial hygiene program, including proper engineering of the various tasks and control of inherent health hazards, job training, suitable hours of work, rest periods for arduous or intensive tasks, proper placement and supervision of workers, well-balanced meals, and a vigorous campaign of health education. Any interest or concern that management shows for the health and welfare of employees has been demonstrated to increase morale and efficiency.

The rapid advance in industrial hygiene services and practices in war industries is doing much to improve the public health generally. The intensive educational campaigns on nutrition conducted by many plants is resulting in much better food selection and preparation by workers and their families. Mass x-ray surveys for tuberculosis case-finding are uncovering many unsuspected and communicable cases as well as their contacts. These are resulting in placing these cases under treatment while there is a good chance for recovery and in preventing the further spread of the disease. Finally, the general program of health education and medical supervision in these plants is acquainting all persons with the importance of the value of a broad industrial hygiene service for maintaining manpower at maximum efficiency.

LIEUT.-COL. RAYMOND HUSSEY concluded the discussion on "Recent Data on Health Hazards in War Industries," commenting first upon the U. S. Army Industrial Hygiene Laboratory at Johns Hopkins University, and describing its organization and operation.

Emphasis was placed on the following points: (1) the application of preventive engineering and medical practices for a safe and healthy employment environment; (2) investigations of the environment in certain instances,



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RESEARCH IN THE SERVICE OF MEDICINE

using engineering methods; (3) studies of materials and equipment; and, finally, (4) the provision of a chemical laboratory for adequate determinations needed. Containers are provided for the shipment of samples. Surveys of working conditions are followed by periodic check-ups as found expedient. Personal hygiene and industrial sanitation are also included in these surveys. Particular emphasis was placed on the importance of solvent vapors.

More recently there has been a study made with respect to radium dial painting, particularly with respect to the institution of control measures and adequate supervision in their use. The maximum limits of exposure were also discussed. The variations of standards in different localities were noted. The amount fixed in the body was stressed as probably the most important criterion—0.1 microgram being the limit corresponding to an exposure of 10-12 curies per liter.

As another example of specific control, the manufacturing operations of a delousing powder against typhus were cited—in this it was necessary to protect the employees against the toxicity of the elements of the powder.

In closing, it was stated that it was hoped that the periodic check-ups in this program set an example for industry generally. Acknowledgment was given to certain Federal agencies and civilian groups, specifically mentioning the U. S. Public Health Service, U. S. Department of Agriculture, the Bureau of Entomology and Plant Quarantine, and the U. S. Bureau of Standards.

Fluorides

DR. EDWARD J. LARGENT presented a paper by himself and DR. ROBERT A. KEHOE on "Fluorides as an Industrial Health Problem."

Two types of exposure are identified with respect to fluoride compounds: the acute which has reference to the effects on the skin and the respiratory system, and the chronic which is characterized by exostoses in certain bones of the skeleton. In a series of lantern slides, statistical data were presented with reference to the use of materials containing fluorides, and a long list of operations in industry was also exhibited.

Urinalyses are important in persons exposed to fluorides, the results of these showing that an exposure of two parts per million in the industrial environment indicates the storage of amounts recovered in the urine.

Beryllium smelting is the only acute exposure in industrial operations which has thus far been confirmed. Also only one x-ray has demonstrated the actual changes in any individual case thus far. This is to say that all other x-ray evidence has been negative. Figures on certain industrial groups indicate that certain excessive amounts exist in the exposure, but no changes other than the one x-ray noted above have been experienced which can lead to a definite diagnosis. Experimentally, 35 milligrams of fluoride material have been administered daily without the production of symptoms. The symptomatology has previously been well discussed by foreign investigators.

Data on acute poisonings are available, but very little with respect to the effects of chronic poisoning.

Finally, it is important to x-ray employees who are exposed to various kinds of fluorides both before and on the job, and to notice particularly the changes which may occur in the mandible and also the vertebral column.

DR. O. A. SANDER presented "Further Observations on Lung Changes in Electric Arc Welders."

Because of the tremendous increase in the use of electric arc welding in the present war production program, it is desirable again to review the available data on the effect of the fumes on the lungs and to determine if possible whether welders today are being adequately protected from excessive fume inhalation.

It has become quite generally recognized that both acute and chronic lung changes may occur when welders are exposed to highly concentrated fumes. The acute reactions have been studied at length in the past, especially the metal fume fevers, and will not be given any detailed consideration here. It is the chronic changes which have been recognized most recently about which there still appear to be doubts as to proper evaluation. Their visualization on chest roentgenograms has been of especial interest to the author since 1935, when he x-rayed his first group of welders showing these changes.

It will be recalled from DR. SANDER'S original report that the lung changes as seen on chest roentgenograms consisted of discrete nodular shadows uniformly distributed throughout both lungs, resembling somewhat the appearance of classical silicosis. The borders of these nodules were generally more sharply defined, however, than are silicotic nodules and the hilum shadows less prominent. Histologic sections from the postmortem material of one of these cases showed iron pigment deposits in the lymphatics surrounding the blood vessels, and it was concluded that these iron collections were responsible for the nodular shadows seen on the x-ray films. These iron deposits had resulted from the use of bare metal electrodes on very confined jobs in the manufacture of gasoline and milk tanks for trucks. It was emphasized that the iron appeared to excite no reaction of any kind, and evidence of fibrous tissue proliferation was entirely lacking. These pathologic findings have thus far not been confirmed in this country, but F. Koelsch, a German clinician, appears to be in complete agreement in his 1941 report, which included one postmortem study. Norbert Enzer now has three additional postmortem studies with the same findings, which he will publish soon. In his animal experimentation with welding fumes, Leroy U. Gardner was unable to find iron deposition in the lung lymphatics of his animals, but roentgenograms of their lungs after removal from the body showed slight evidence of metal accumulations. These appeared to be due to large collections of phagocytes containing iron granules and lying within the alveolae. There seems to be no good explanation as to why these phagocytes had not migrated into the lymphatic channels, as had occurred in the human case referred to. These animals demonstrated conclusively, however, that when finely-divided particulate iron is inhaled into the lungs in large doses, it is not absorbed into the blood stream, as minimal doses are. Harrold, Meek and McCord's animal experiments also proved this.

DR. SANDER has frequently been asked if he has seen roentgenograms from other plants showing similar nodular changes in welders or if there might have been some quite unusual hazard in the plant making the tanks. He has examined and x-rayed approximately 500 welders, but it happens that he has only one other plant requiring very confined work for its welders. Similar early changes were found there, but in no others has he seen such nodular changes. Britton and Walsh found 24 with nodulation out of 256 welders studied. It was DR. SANDER'S privilege to see several films from Cleveland recently, sent to him by Dr. Jean Groh, a roentgenologist, who found nodular changes on the roentgenograms of 54 out of 80 welders whom he had x-rayed in one plant. It is interesting that these welders were working on jeep frames exclusively, and the work was not especially confined. However, it

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appears that the overhead location of the exhaust hoods may have tended to draw all fumes past the breathing level, which probably has been corrected by their replacement with down-draft and side-draft ventilators. The two whose films he saw, which were typical of iron deposits, had worked as welders only six or seven years, indicating an intense exposure. Apparently it is not necessary for work to be extremely confined in order to have excessively concentrated fumes at the breathing level. Ventilating engineers would do well to consider the proper placement of the exhaust hoods.

So far as other evidence of lung irritation is concerned, DR. SANDER has not found any remarkable degree of bronchitis in welders generally, including those who obviously had had intense fume exposure. Nor have the many welders he has interviewed had such complaints as "severe cough following welding, pain in the chest, hoarseness, difficulty in breathing, stomach distress, loss of appetite," as have been ascribed to welding by a few investigators. He never has seen or heard of a case of "welder's pneumonia" or pulmonary edema in his district. The only possible explanation for this is that the fumes contained insufficient amounts of the known irritant metals or nitrous gases to have caused acute reactions. None of the industries in which he studied the welders requires the welding of special alloys containing any appreciable amount of such metals as cadmium or arsenic, for instance. The electrode coatings also appear not to have added any significant amount of irritating substances to the fumes, because the welders he sees have been using them exclusively for the past 10 years.

It should not be inferred from these statements that he feels that all welding is entirely innocuous so far as effect on the lungs is concerned. Quite the opposite, it is known that exposure to highly concentrated fumes may be definitely harmful under certain circumstances, especially when they contain appreciable amounts of irritant substances, and certainly it is anything but pleasant for anyone to be working in dense clouds of any fumes for prolonged periods of time.

DR. SANDER gave the following conclusions:

1. Electric arc welding which is done in large rooms, and where the fumes are not allowed to concentrate excessively near the breathing level, does not cause any lung changes even after many years of work.

2. Excessive inhalation of concentrated fumes, especially in confined and unventilated spaces, may cause siderosis (iron deposits) in the lungs in from six to 10 years. The siderosis so produced consists only of inert iron pigment deposits in the lymphatics, without fibrous tissue proliferation and without progressive changes after exposure is materially decreased.

3. Electric welding or siderosis do not predispose to tuberculosis or other lung infection.

4. The siderosis of welding causes no functional impairment of the lungs and, therefore, no symptoms referable to the lungs.

5. Any respiratory involvement may be prevented in welding, even with the most confined work, if proper precautions are taken, either by adequate exhaust ventilation or positive pressure respirators, or both.

Disability in Silicotics

DRS. L. U. GARDNER and GEORGE WRIGHT presented the final discussion on the Wednesday afternoon program, entitled "Progress Report on a Study of Disability in Silicotics."

As reported at the last annual meeting, they had been unable to detect evidence of unusual shortness of breath or impaired pulmonary function by an elaborate study of a group of silicotic miners from a New York State iron mine. These men were all young, still at work, and had no symptoms or complaints, but their x-ray films revealed generalized, first or second degree silicosis. There was reason to believe that their reserve respiratory capacity must have been reduced but the methods used

were not adequate to detect it. During the year just past the authors, therefore, have augmented their program of study to include, among other things, an evaluation of possible cardiac and circulatory disturbances. The latter are important, because their relationship to silicosis is a frequent subject of controversy before compensation boards. Experience to date indicates that simple discrete silicosis has no effect upon the heart but that in the conglomerate forms, owing to associated, healed infections, there may be secondary cardiac changes.

Development of the protocol of study has required a large amount of experimentation; certain approaches remain technically difficult, and extensive work on animals will be necessary before they can be applied clinically. At present, one complete examination requires two and one-half to three days. Progress has been made but the complete picture is only faintly perceptible. The utility and objectives of the new program will be illustrated by comparing the findings on four men, three of them young and the other much older.

1. A normal subject with no exposure to dust in occupation.
2. A miner with simple third degree silicosis and no functional derangement.
3. Another miner with the same degree of silicosis revealed by x-ray but with symptoms and a diminished respiratory capacity.
4. A miner with massive conglomerate silicosis, marked dyspnea and impaired function.

In the third case, this man suffers from a progressive type of silicosis due, presumably, to excessive exposure in early life. He would also seem to be one of those individuals unusually prone to develop silicosis because of poor upper respiratory protection. His obvious difficulty may be due in part to the components other than quartz in the dust of his mine, which differ materially from those in the iron mines where all the other cases have worked.

This miner, aged 35, is now a shift boss underground; he does not want to lose his chances of promotion by quitting, but for the past year he has been concerned over his shortness of breath. In May he was carefully studied and informed of the possibilities of treatment with aluminum which he was anxious to try. It was not possible for him to come to the field laboratory, 120 miles away, where other cases are inhaling metallic aluminum powder from the mill prescribed by the Porcupine Clinic at Timmins. He was asked if he would care to test on himself the action of the powdered hydroxide of aluminum which was found highly effective in animals. He assented and was given a small quantity of powdered alpha monohydrate of aluminum which he inhaled from a simple apparatus consisting of two bottles, an atomizer bulb and a valved mouthpiece. His response was as prompt and as favorable as that of others to the metallic powder. The mine manager immediately wanted 50 inhalation sets, but the authors have thus far selected only one other case for experimental testing of this form of aluminum.

When brought back for retesting after 50 daily treatments, and again after approximately 50 more, there was no essential difference in his performances at rest and during exercise. The authors state that they will be surprised if still further treatment causes measurable improvement in his performance; their own experience is too limited to permit definite conclusions, but what they have observed themselves and the results of the Porcupine Clinic lead them to suspect that aluminum therapy will rarely, if ever, result in much alteration of functional measurements. The case cited seems a striking example of the profound psychological disability which is produced by the knowledge that one is afflicted by a disease. Treatment has not materially decreased the true functional disability, but it has entirely dispelled the psychological reaction which exaggerated that disability. This does not mean that treatment will be discontinued on this man. It will be continued, to give him the needed

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assurance that something is being done for his condition, and, more important still, it should stop further progression of his silicosis. The latter seems to the authors the most important use for aluminum therapy. They feel certain that it will prevent the development of silicosis and even cause retrogression of incipient disease. It has a real place in protecting persons like this man who face ultimate permanent disability, whether they quit their jobs or continue to work where they are best qualified. His mine is under good industrial hygienic control, but there is still some silica in the air. "Susceptible" as he apparently is, added exposure may hasten his total incapacitation. Aluminum should neutralize any quartz that he inhales in the future and hold his disease at its present level. Treatment will also give him the psychological support that is essential to his well-being.

Experiments must be tried with other substances to determine whether this interpretation of the effects of treatment in man is correct; certain animal tests are also in progress which may shed light upon this question.

The other two miners inhaled *metallic* aluminum powder. They likewise show no improvement in performance but, in contra-distinction to the first case, they manifest little enthusiasm for the treatment. This seems entirely reasonable, for one of them had no symptoms in the first place, and the other has such far advanced conglomerate fibrosis and emphysema that his physical impairment is sufficient to account for his disability.

Women In Industry

DR. C. O. SAPPINGTON opened the Industrial Relations Session, on the subject "Maintenance of Woman- and Man-power in Industry," with the report on "Health Problems of Women in Industry."

The industrial employment of women in increasingly large numbers in the recent past has focused sharp attention upon certain problems—some real, and others highly theoretical and speculative—with which medical, management, safety and industrial relations personnel are naturally concerned. It was the purpose of this Foundation-supported plant-to-plant study, in interviewing physicians, safety directors, industrial hygiene engineers, nurses, woman counselors, personnel directors, and employees, and observing working conditions, to find out just what the "woman problem" actually is in industry under wartime conditions.

During the spring and summer 54 plants were visited, with a total population of 452,000 persons, of whom 131,000 were women; 10,000 miles were traveled. The individual plants varied in population from 320 to 25,000, the common range being 2000 to 10,000. The establishments were located in 14 industrially developed areas, in 10 different states, in the east, southeast and midwest. The selection of the different types of manufacturing was as variable as possible under wartime conditions, including aircraft, tanks, munitions, small arms, machine guns, small and large electrical devices, radio, communication apparatus, steel and other heavy industries, ships, chemicals.

Some of the physiological problems of women, as well as others, are perhaps of more general interest and, therefore, the subjects of dysmenorrhea, pregnancy, menopause, pelvic examinations, the problem of married women with young children, methods of induction and supervision, have been selected as subjects for brief discussion.

Dysmenorrhea—Most of the plants included in this survey found that dysmenorrhea was not a significant problem. In fact, the majority of plants kept no figures on the incidence of this physiological disturbance.

Pregnancy—There was a great variation in policy with respect to pregnant women in different organizations, varying from a distinct aversion to the employment of pregnant women in any kind of job, to rather loose supervision, allowing women to work a considerable length of time during pregnancy. The majority of plants did not hire pregnant women, if they knew the applicant to be pregnant, and did not allow pregnant women to continue to be employed when pregnancy was evident. This was managed by granting leave of absence, in most instances at six months, making provision for no loss of seniority or other privileges during leave. Return to work was permitted two to six months postpartum, depending upon arrangements for child care, whether the child was to be nursed by the mother, and other obvious considerations. Wherever pregnant women were working, careful supervision was exercised as to the kind of work done, and they were protected to the fullest extent against potentially harmful exposures. It was freely acknowledged by most persons interviewed that it was difficult to state when a woman was pregnant by the customary physical examination and, therefore, many women were employed in the early months of pregnancy, not admitting the fact when asked.

Menopause—This condition apparently presented no problem in most of the establishments visited, and this was to be expected because of the age grouping of the women employed. However, there is an increasing tendency to employ older women and, as more experience is available, the data will be more reliable.

Pelvic Examinations—Most physicians did not do a pelvic examination on women applicants. There was considerable variation with respect to the policy of those groups which did make some pelvic examinations; an occasional medical department reserved the right to do pelvic examinations, particularly on multipara, or based upon menstrual or other history, and in such instances there had been no refusals.

Married Women with Young Children—This type of employee offered the most frequent and most difficult problem occurring in this survey. The chief loss of time by women employees, so far as could be determined, was caused by their inability to carry the tremendous load of doing two jobs at the same time, one at home and the other in the factory. Complaints of employees, supervisors, management, physicians, and all types of personnel, were numerous from this cause, and the problem was common to most plants visited. It appeared also to be the chief reason for the frank fatigue in women employees, because of lack of proper rest and recreation.

The common solution of this problem in most plants is not evident, but in certain areas the building of day nurseries has apparently been the best move as yet. However, most communities do not have these facilities, or apparently have not developed them. Reliance on domestics and relatives has not been satisfactory. Labor turnover and absenteeism have greatly increased. If the problem becomes acute, materially affecting production, it may be necessary to restrict the employment of married women to those who have no children under 14 years of age, as has been done in Great Britain.

In some small plants in small communities, there seemed to be an "epidemic" of wanting to change jobs and also wanting the same shift on which the husband worked; the expression "nervous exhaustion" had frequently occurred in certifications, by family physicians, for leave of absence or change of job. In one middle western group, a precision industry, inquiry concerning child care was routinely made a part of the application for employment; this organization expects to go into more detail with respect to the social service angles of this problem later on, particularly with regard to day nursery provisions and visiting nurse check-up.

Young unmarried women and women with adult children apparently do not cause similar difficulties attributable to home responsibilities, although these women also contribute somewhat significantly to absenteeism, leave, and labor turnover—this because of sweethearts, sons, or husbands in the Services, occasioning temporary or permanent separation from employment, as can be well understood.

Induction and Supervision—Personnel problems are always better controlled in plants where there is an adequate induction program and a well managed scheme of supervision; troubles increase in direct proportion to the lack of such activities.

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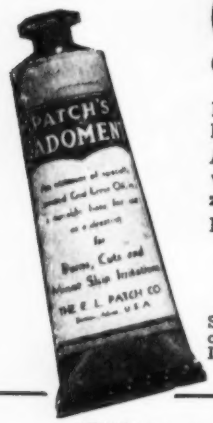

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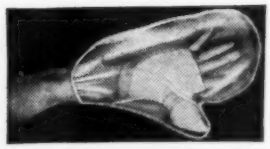

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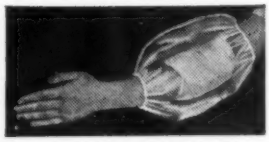

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MRS. WARWICK B. HOBART discussed DR. SAPPINGTON'S presentation, pointing out that terminations and absences are considerably higher at the present moment for women than for men and fall under two main heads: (1) ill-health, and (2) home responsibilities.

While it is true that some terminations are assigned to ill-health that should be classed other places, nevertheless, even allowing for a small percentage of such misplaced classifications, it still remains a fact that health factors present the primary difficulties in the employment of women. In breaking down the different types of problems presented in health, it seems that there are three main ones.

The first is the difficulties related to the child-bearing function: (a) Menstrual disturbances do not constitute a very large problem numerically, and are not nearly so extensive as commonly supposed. (b) The menopause has not presented particular problems in the employment of older women, many of whom are going into the plants since all arbitrary top age limits have been removed. (c) The problem of the employment of pregnant women, however, presents very serious difficulties; largely because management has not yet seen fit to enunciate clear-cut policies which would permit pregnant women to work at suitable jobs, but rather has taken the position that employment should be terminated. With the increasing responsibility of women as prime wage earners, and the induction of fathers into the Services, it is going to become imperative that we devise policies allowing pregnant women to work at suitable occupations during the major portion of the course of their pregnancy.

The second cause of ill-health is due to special strain, with women being unable to meet the particular demands of particular jobs. For instance, we find many women assigned to standing jobs, suffering from various disabilities of the feet and legs.

The third, and by far the largest group assigning ill-health, leave because of fatigue. This cumulative feeling of tiredness develops in many of our women after several months of industrial employment, and they feel unable to pursue their jobs further. It develops in around three to four months. This problem of fatigue presents the largest single difficulty in the employment of women because it is not only composed of physical and psychological aspects but is also related to social organizations and patterns which are very difficult to modify or change.

The second largest leaving cause, after ill-health, is home responsibilities. As DR. SAPPINGTON pointed out, we have not yet solved at all the problems of *child care*, but he did not point out what is a fact, that most women, whether married or single, carry *home responsibilities*, and these are not always related to the care of children. Quite as often, women carry the burden for aged parents, and other relatives or incooperative husbands, and it is just as great a drain on a woman's strength to take care of grandmother as it is to take care of her own child.

As a first suggestion, it seems that selection programs need to be revised generally and made more adequate. Better pre-employment examinations to establish general health, pregnancy or non-pregnancy, special physical qualifications for special requirements of the job are a basic necessity. It is only common sense to put women on jobs for which they have capacity, and the typical woman is unequal to many of the jobs of heavy industry. This means a very much closer coordination between the medical departments and placement departments than has been usual. It also means that medical departments will have to know the jobs for which they are examining with a great deal more thoroughness than in the past. In the case of occupations involving the handling of, or being in the presence of, toxic substances, regular periodic examinations should be conducted. Another element of the selection process that has a bearing upon health is the interview, which should disclose (1) temperamental fitness for jobs, (2) attitudes toward work, and (3) the actual responsibilities which women carry upon assuming indus-

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* Kornaky, K. J.: West. Jnl. Surg. Obstet. and Gyn., Vol. 51, p. 150, April 1943; condensed in Cur. Med. Dig., July 1943, p. 43.

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trial work, including the number and ages of children. It is impractical to wait until a woman is worn out with effort in trying to take care of her children or other dependents and her job before we discuss the problem with her or even know that she has a problem.

The second means for meeting problems of health, particularly fatigue, reflects itself in very much better training. Most plants have done a superlative job in the technical phases of training, but have yet to see that, in relation to women, psychological aspects are of great importance. Training should concern itself with better orientation or induction programs, which should discuss not only the rules and regulations of the plant, but also the worker's place in the organization; the function of the organization; elementary safety, (and, particularly with women, the proper kind of clothing to be worn), and finally, the conduct that is to be expected. With women, unless there is a sense of importance about the job, there is a tendency not to push through when the going becomes difficult.

A second aspect of training that is of great importance in relation to the employment of women is the need for definite health and fitness programs. It was the discussant's opinion that, with the proper coordination of training and medical departments, short periods can be frequently devoted to various aspects of health. This is especially needed because of the double obligation that most women carry, and the fact that a great many of them do not follow ordinarily recognized programs of proper self-care, and are the victims of many old wives' tales.

Long hours of work still take their toll, and industry should get away in general from anything beyond the eight-hour day, 48-hour week standard. It is cited that in England women work somewhat longer hours than this, but it should be remembered at the same time that a great many services are provided for them after work hours, and that transportation does not involve such distances as are common in this country. Indeed there are people in the War Department establishments commonly traveling 100 miles round-trip every day. Hours of work should be broken by rest periods, varying according to the intensity of the job, but having a minimum of 10 minutes each half shift.

The health of women in industry can be improved through providing better services. Where plants have promoted a good feeding program, there has been a very marked improvement not only in attendance of the women at their jobs, but also in production itself while there.

Another service that needs attention is provision for child care. This means cooperation with the local community. So far little effective work has been done in this field, and it warrants considerably deeper study and more accurate information. It is a mistake to think of child care progress primarily in terms of institutionalized care of small children. Many other children need care, and the adolescent child can cause as much drain on the mother as any other. It may be that the best method of child care is to shorten the length of shifts to perhaps six hours; to increase the time of rotation of shifts; and to have more assigned to permanent shifts, rather than the extension of institutional means of child care. The discussant believes very much broader experiments in the employment of women on a part-time basis should be undertaken, which would allow the women to care for their own children, which is ordinarily their ambition. It seems that these adaptations would not only pay dividends to the plant involved, but would also forestall some of the social consequences that arise when mothers cannot be associated with their children over any appreciable length of time.

In addition to food and child care, there are many other services that contribute to the increased health and efficiency of women which could not be gone into, but it was pointed out that length of transportation time, poor toilet and rest room facilities, and poor housing all detract from women's health, and build up this cumulative fatigue which is the big factor in their absences and terminations.

Staff modifications should also take place in a plant. Women counselors are of very great value, but it is a mistake to think of them only as counseling the women. It is quite as necessary for them to counsel with management on the various modifications across-the-board in their personnel program that must be made for the employment of women. This means that counselors must be something more than sympathetic souls; they must be versed in industrial practices and needs, with a sense of production, and with a very firm desire to provide services for the women with a view to increasing production.

In spite of the fact that most plants still have important modifications to make in their programs for the employment of women, it is only fair to say that management is more and more definitely aware of the problem and trying to work it out. They are very much in an area of unknown terrain but, as facts are uncovered, they get better performance. Management's experience with the employment of women has on the whole been very satisfactory from a production point of view; in fact, in some cases, it has been appallingly flattering. The result will be, MRS. HOBART thought, that after the war all industries will have a very much larger percent of women. Many will be the sole support of their households. This group will increase with the lengthening of the war. Many others will be there, however, because management prefers them to men, having discovered that many women have very high skills which were never utilized before, and they will be unwilling to go back to their old way of conducting their enterprises.

Health in the Later Years

DR. EDWARD J. STIEGLITZ spoke on "Health Problems of the Older Employee and Employer."

Senescence is that part of aging which occurs after the peak of full maturity. Aging is a series of changes which begin with conception and end only with death. Though continuous, the rate of change is not uniform. The first overt consequences of senescence usually become manifest somewhere near 40 years of age, although occult changes have been progressing for years before this time.

Conservative estimates by the U. S. Bureau of the Census, assuming no more immigration or emigration and ignoring the effects of the war, predict that in 1980 more than 40% of our people will be 45 years old or older. In the United States today there are more than 13 million people aged over 60, of which more than nine million are 65 or older.

Industry's concern with various aspects of the broad problem is twofold: (1) it must recognize the importance of early discovery of progressive disease in older persons and assist industrial medical services in such discovery, and (2) it must realize that, before severe disability makes continued employment impossible, there is usually a long period of impairment of efficiency. Many business disasters could be traced to arteriosclerosis in executives. On the other hand, the early discovery and prompt institution of proper medical management of diabetes may conserve for industry many a fine, precious and useful mind.

The essential elements which must be kept in mind are that (1) aging introduces changes, which are not necessarily in the direction of impairment of usefulness; (2) biologic age may differ widely from chronological age; (3) with advancing age there is increasing variation between individuals; (4) health analysis of senescent persons requires far greater individualization and thoroughness of search than in younger persons, and (5) preventive health measures must likewise be individual rather than merely environmental. There is no intention to belittle the value of improving environmental conditions, but alone this is not enough. To establish and maintain maximum working efficiency we must consider the individual as well.

The question of accident hazards in relation to age can be dismissed quickly. Casualty insurance rates are not affected by employee age. Though the severity rate of accidents increases with age and longer periods are required for repair and recuperation, the frequency rate

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of disabling accidents falls to such an extent that the two elements effectively cancel themselves out. Except in occupations requiring exceptional agility and speed of muscular coordination, senescence can be ignored as contributing appreciably to the accident risk.

From the point of view of the individual, premature retirement while still vigorous, ambitious and anxious to serve, can be a major disaster. It is sad but true that it is often the men with the greatest drive and unity of purpose who are prone to break under these circumstances. Only lazy men or men with multiple constructive interests welcome retirement.

We should apply the principle that job assignment should be made to fit the man as he changes with age. It is truly absurd to say that at 64 years, 364 days, a man is capable of doing a responsible and important job and that 24 hours later he is "too old to work."

Senescence of key personnel poses the most important questions of all those considered here. It is good business to insure valuable and productive tools against damage, as well as against loss. Therefore health maintenance of these men is an integral and essential part of industrial medicine.

By the term health maintenance we imply maintenance of work efficiency. The idea of seeking medical guidance and reporting minor, but possibly significant, symptoms is often pathetically abhorrent to the rugged individualists who are the men who really count. They frequently resent the idea that their health is anybody's concern but their own. Nevertheless, their health and efficiency are the concern of personnel management in the same sense that the efficiency of a fleet of trucks or a battery of expensive and complicated machines is part of the plant maintenance. Though the "tired business man" has been the butt of many jokes, it is no joke that his weariness impairs his efficiency. Brain power is the most precious part of man power. Because of these and other reasons we maintain that attack on the problems of senescence in relation to industrial efficiency should start at the top.

Specifically, periodic health inventories should include consideration of the following possible aids to greater health and enhanced work efficiency: (1) analysis of capacities can reveal the limits of exertion and/or mental strain beyond which it is unwise to go; (2) discovery of correctible defects in their incipiency makes possible correction before irreparable damage results; (3) early discovery of chronic and progressive disorders, such as diabetes, hypertension or arthritis, makes possible the institution of medical management to retard the progression of the disease, and (4) there is an opportunity for education in personal hygiene, particularly in such matters as diet, fluid intake, play, adequacy of rest and emotional conflicts.

Furthermore, retention of personnel in positions of great trust and responsibility when not fully fit is downright dangerous. It is wasteful to permit the physically exhausted individual, who is running on his nerve and likely to crack at any moment, to continue in a directive capacity. Just as it is the Flight Surgeon's assigned responsibility to ground pilots when not fit to fly, it should be the responsibility of industry's medical advisers to "ground" key personnel when unfit to carry on. Lastly, the application of thorough physical and mental inventory should start at the top, because labor has always been opposed to periodic examinations. Such is the childishness of mankind that if this be offered to management and not to labor, it won't be long before labor will clamor for it.

For the maximum conservation and effective utilization of manpower the following essentials must be recognized:

1. Both now and in the future industry must employ an increasing number of older persons. War and the changing population structure leave no alternative.

2. Though senescence affects industrial efficiency considerably, its effects are not at all in the nature of decline. As we age, certain capacities are amenable to development. Men have potentialities for multiple skills and many spheres of usefulness; to discard these because one capacity has depreciated is gross and dangerous extravagance. There are many kinds of fitness.

3. The immense loss in industrial efficiency due to relative impairments of health, insufficient to cause absence from work but sufficient to greatly reduce work effectiveness, has been almost wholly neglected thus far. Prevention of much of this loss is possible by the application of individualized constructive medicine. Purely wholesale measures designed to better the work environment alone cannot suffice.

4. The importance of key personnel cannot be overemphasized nor the urgent desirability of conserving and improving the abilities and work efficiency of these older men, not for the sake of the men themselves, but for the sake of the job to be done.

Absenteeism

DR. W. M. GAFAFER, in closing the Industrial Relations Section part of the program, presented a statistical report on "Reducing Manpower Losses."

At the Industrial Hygiene Foundation meeting of 1940 member companies were presented with a plan for the periodic reporting to the Foundation of their sickness disability data, the analysis of the data to be performed by the U. S. Public Health Service. The interest shown by a number of the companies was gratifying and thus far there are available disability data covering the years 1941, 1942, and several months of 1943. But the data deal only with disabilities lasting eight days or longer. Thus the material reflects only a part of the losses from sick absenteeism. The availability of two full years of data, however, makes possible some pertinent comparisons. It is the primary object of this paper, the fourth of a series, to present a number of these comparisons together with a brief summary of current practices aimed at the reduction of manpower losses.

Causes of Absenteeism—The causes of absenteeism are now well-known. The main force precipitating an absence may be biologic, sociologic, economic, psychologic or physical. The principal agent involved may be the worker, the job, the plant or the community. Furthermore, reasons may be classified under personal sickness or personal reasons; and absences may be classified into those that are unavoidable and those that are avoidable. It is appropriate to refer to the observation recently made by management that new causes of absenteeism are appearing, principally because of the feeling that the war will end shortly and that the time is now propitious to search for a job that will not be terminated when hostilities cease.

Absenteeism Experiences from Foundation members and some results from other sources follow:

Industrial Hygiene Foundation—Cases of sickness and non-industrial injuries, lasting eight days or longer, beginning during the years 1942 and 1941, among employees in 10 companies reporting to the Foundation:

	All disabilities		Non-industrial injuries		Total sickness		Sickness					
							Respiratory diseases		Digestive diseases		Non-respiratory non-digestive diseases	
	1942	1941	1942	1941	1942	1941	1942	1941	1942	1941	1942	1941
	Annual number of cases per 1,000 males											
All companies	85.9	83.1	9.0	9.7	76.9	73.4	33.4	33.2	15.3	14.6	28.2	25.6
	Annual number of cases per 1,000 females											
All companies	90.6	101.8	4.5	8.6	86.1	93.2	37.6	37.7	22.0	21.0	26.5	34.5

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New York State—Absence rates in 15 war production plants varied from 3.1 to 9.3% during May, 1943; for males the rate was 5.4, and for females, 9.8. Pay-day absence rates were lowest, while Saturday and Monday absences were highest. Among causes of absenteeism were found those related to housing, transportation, changing character of labor force, child-care centers, and working conditions.

West Coast Plane Plants—In 1943 the absence rate rose among males from 3.2% in January to 5.9% in mid-July, the corresponding percentages for the females being 6.2 and 10.2. Personal illness exacted the largest toll of absences, 67.4% of all absences among the males and 69.5% among the females. Illness or death in family yielded 7.2% and 9.7% of the absences for males and females, respectively, while the corresponding percentages for personal business were 11.2 and 8.8. Housing and transportation were credited with 3.4% for males and 3.1% for females. The remaining percentages amounting to 10.8 among males and 8.9 among females were accounted for by "miscellaneous and reason not given."

Reduction of Absenteeism—The first step towards the reduction of manpower losses is, obviously, the keeping of appropriate records for the determination of where, when, and under what conditions the losses are occurring, and making the results known to the workers. It is essential also for the purpose of making comparisons within and among companies that a definition of absenteeism be formulated and adhered to in the recording and analysis of absenteeism data. An analysis of the records will reveal certain causes, and appropriate action as indicated below has been found helpful.

Illness and Injury—The causes that are classifiable under illness and injury require the attention of the plant medical and safety departments. Included in the activities of these departments are the various examinations of the worker and his working environment leading to appropriate recommendations and action. Man-hours can also be saved by the cooperation of the local and plant physician with regard to requests for certification made of the local physician by the worker. Reference is made specifically, first, to the granting by the local physician of long leaves of absence for minor disorders; second, to the matter of requests for change of shift for every nameable medical excuse; and third, to requests for change of job because of an imagined hazardous job environment.

Personal Reasons—Since the reasons for absence are implied in the remedies, no reference will be made to specific reasons. The application of particular remedies depends considerably on the factors determining the characteristics of the labor force; mention is made, among other factors, of race and sex. The remedies may be roughly but conveniently classified according to the agent principally involved in effecting them, the agents being the plant, the community, or both in cooperation. Some of the suggested remedies for the reduction of absenteeism on account of personal reasons follow:

Plant—(1) Proper classification of employees to insure best utilization of skills, and provision for appropriate transfer of workers; (2) determination of home responsibilities before hiring women workers; (3) hiring of housewives, white-collar workers, and students for part-time work; (4) arrangements for authorized leave or part-time attendance for certain workers; (5) establishment of machinery for sympathetic discussion of worker job problems; (6) adequate supervision of personnel, with continued checks on worker-supervisor relationships; (7) in-training and up-grading programs; (8) training program for superiors; (9) inauguration of publicity and morale-building campaigns to impress workers with the importance of being on the job and to promote the feeling of personal participation in the war work; (10) establishment in the plant of eating, post office, shoe repairing and any other facilities that might be indicated; (11) establishment in the plant of ration boards, and draft-board and tax advisers; and (12) formulation of disciplinary measures in cooperation with labor-management committees and unions.

Community—(1) Cooperation of local professional societies to provide legal, medical, and dental service to workers during non-working hours; (2) cooperation with community in establishing and operating child-care facilities; and (3) discouragement of job-shopping.

Health Hazards in Shipbuilding

PROF. PHILIP DRINKER, opening the group of papers in the Engineering Section of the program, discussed "The Control of Health Hazards in Shipbuilding, including Welding."

On entering the present war, this country possessed only a few shipyards with any real experience in building either war vessels or merchant ships. In addition, there were a few repair yards on both seacoasts and on the Gulf, but their peacetime volume of business was not great. The construction programs of the Navy and the Maritime Commission suddenly demanded enormous increases in shipyard facilities—new yards had to be built and old yards expanded. Today there are something over 400 yards building everything from lifeboats to battleships, and located on all three seacoasts, on the Great Lakes, and on our navigable rivers. Excluding government-operated Navy yards, there are now over one and a half million workers, of whom about 10% are women.

The effort is made to keep two full-time doctors for every 5000 shipyard employees and another doctor for each additional 5000. Like the rest of industry, the shipyards are suffering from a shortage of doctors, and they get no special consideration merely because the government owns the yards.

In two new shipbuilding communities, Vancouver, Washington, and Richmond, California, the contractor, the Kaiser Corporation, instituted a medical insurance scheme whereby the worker receives full hospital and medical care for a small weekly payment. At Vancouver the workers' families participate in the scheme. From the standpoint of the Maritime Commission and of the states in which the yards are located, the plan has been a great success. It was put through simply because existing medical facilities were entirely inadequate to cope with the sudden increase in population.

Like the rest of industry, the yards expect to hire increasing numbers of soldiers and sailors discharged for various disabilities. They have no rigorous physical requirements and do not intend to adopt any. The only wish is to make certain that workers are fit for the job to which they are assigned and that they will not be a menace to themselves or to their fellow-workers. The yards have workers with one arm, one eye, or one leg. A large eastern yard employs a safety inspector who had lost both arms in an accident prior to coming there.

On the west coast, the present labor agreement specifically excludes physical examinations, but, as labor understands that we want the physical examinations for placement, not for hiring or firing, opposition is disappearing.

Flash Burns—The term "flash" implies that the briefest of exposures to the welding arc will cause damage to the eyes. Actually we know that momentary exposures, excepting always the explosive type of reaction, do not cause flash burns. The offending radiations are, of course, the ultra-violet in which the welding arc is fairly high. The resulting burn to the conjunctiva or white of the eye is comparable to snow-blindness or sunburn. It makes itself felt as "sand in the eyes" some six hours after the exposure. It was shown in 1916, by Verhoeff and Bell, that the effect on the eye of injurious radiations varies directly with the duration of the exposure and inversely with the square of the distance—i.e., a four-minute exposure is twice as serious as that of one or two minutes, but an exposure at a distance of three feet is four times as severe as one at six feet. They showed also that the effects of short exposures over a single day were cumulative.

Using a typical welding set, we have demonstrated recently that the severity of the dosage from any welding arc at any distance can be measured easily. Since dosage includes both time and distance, it now is a simple matter to determine what protection is needed in order to prevent flash burns under any particular circumstances.

From the practical standpoint, safety goggles of clear glass, intended to protect against impact and equipped

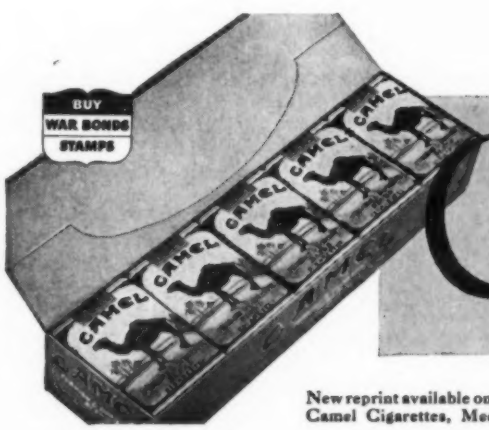
"Ready!" the pilot warns... Five tense minutes to go . . . the men "hook up" for the last brief check . . . then the paradoctor's command: *"Stand to the door!"* But it is he who leads them off . . . first overside . . . first to face the unknown perils that lie below.

Courageous as he is versatile, the war doctor fulfills long, tough missions without thought of rest. When it's time to relax, he keenly appreciates the pleasure of a good smoke . . . Camel most likely, the favorite of the armed forces*. . . for sheer mildness, friendly taste.

Make it *your* pleasure to remember those you know in the services. Send them cartons of Camels . . . often!

1st in the Service

* With men in the Army, Navy, Marine Corps, and Coast Guard, the favorite cigarette is Camel. (Based on actual sales records.)



Camel—*costlier tobaccos*

New reprint available on cigarette research—Archives of Otolaryngology, March, 1943, pp. 404-410. Camel Cigarettes, Medical Relations Division, One Pershing Square, New York 17, N. Y.

with sideguards, give all the protection needed against flash burns. They are sufficiently opaque to the ultra-violet rays from the welding arc to warrant their use as anti-flash goggles. Furthermore, they can be worn on the night shifts when the tinted goggles make walking around shipyards far too difficult.

Illness from Breathing Welding Fumes—On freighters, tankers, landing barges, and troop carriers there is comparatively little welding of galvanized iron. On virtually all combat vassels, and especially those of light weight, there is considerable galvanized iron and much of this must be welded. All welders, shipfitters, and pipefitters have had some experience with metal fume fever, or zinc shakes, caused by breathing excessive amounts of zinc oxide fume. All yards now go to some pains to see that men welding galvanized plates are adequately protected by local exhausts, air masks, or both.

When iron is boiled in the electric arc its vapor is burned to form ferric oxide which is the color of rouge and is so distinctive that it is used for measuring the pollution caused by welding steel. A small hand-pump serves to draw a known volume of air through a white filter paper disc about one inch in diameter. The resulting discoloration is then matched against standards, with results accurate to within about 15%, which is close enough for field work.

Men working on jobs such as double-bottom welding where ventilation has been inadequate may, after several months, develop a cough which wakes them in the early morning. Sometimes the coughing produces traces of blood. Naturally this makes the men and their families fear something serious, especially tuberculosis. These men do have have any of the symptoms ordinarily associated with tuberculosis—they have no night sweats or afternoon temperatures, they do not lose weight, and their chests generally are normal by x-ray. If such men are shifted to jobs in which the welding fume exposure is slight, the cough soon disappears. Obviously the condition is preventable, and definitely it is transitory. A study of 864 cases of pneumonia among shipyard workers has been completed recently by Drs. Collen, Dybdahl and O'Brien, of the Permanente Foundation Hospital, Oakland, California. Their findings show clearly that pneumonia is no more apt to occur among welders than among other workers in the shipyards. Both in severity and frequency it varies directly with the numbers employed. Also, this same paper shows that the individual's previous occupation and residence bear no relation to the incidence of pneumonia. New workers who have come to a shipyard from other parts of the country soon become acclimated and, after a few months' residence in the new community, are neither more nor less susceptible to pneumonia than are the natives of the community.

Lead Poisoning in Shipyards—It is the usual practice to prime all metal surfaces of Maritime vessels with red lead, while the Navy requires priming with zinc chromate. In some yards the outside painting is done with a spray gun, while in others virtually all painting, both inside and out, is done by brush. In general, spray painters are adequately protected with appropriate masks, but, as all vessels are apt to be crowded during construction, it is very difficult to protect other workers from breathing paint mist.

Welding is supposed to be done only on unpainted surfaces. If steel plates are painted before being welded into place, a six-inch margin is supposed to be left unpainted. Any paint, either lead or zinc, is boiled off by the temperature of the electric arc or the acetylene torch. When a welder is required to touch up some small job that has been rejected by the inspector, he will let the heat of the arc clean the paint off the metal instead of going to the trouble of scraping it off with a wire brush. Welders are provided with respirators approved for use against lead fume, but, in the rush to get ships built, the effort to get them used has not been too successful. However, the incidence of lead poisoning in the shipyards is very low.

A few cases of chrome sores were reported in one government yard spraying zinc chromate, but the trouble was eliminated as soon as the men had proper respiratory protection and has not occurred elsewhere so far as known.

In burning or shrinking plates primed with zinc chromate, there is some irritation from the burning off of the paint film, but the trouble is very easily eliminated by respirators approved for use against nuisance dusts such as silica.

Foundation Plant Surveys

MR. W. C. L. HEMEON presented a report, by himself and DR. FRANCIS R. HOLDEN, on "Highpoints of Foundation Plant Surveys."

During the past year there were over 40 field studies, each one requiring from two to 30 days; and more than 30,000 miles were covered, including one trip to the Pacific Northwest, one to the Southwest, and numerous visits in eastern and midwestern states.

The surveys during the year dealt with a variety of exposures and include arsenic dust; lead dust and fumes; synthetic resin dust; free silica in the form of quartz, diatomaceous silica and silica gel dust; trichlorethylene; fluoride fumes; hypochlorites; carbon tetrachloride; chlorine, and sulfur dioxide; as well as excessive temperatures. It goes without saying that all plants involved are important to the prosecution of the war. Many very toxic materials were found to be handled without any ill effects. One member company uses thousands of gallons of carbon tetrachloride in many places throughout the factory. However, by means of well-planned exhaust ventilation, concentrations of that chemical rarely exceed 10 parts per million.

Skin affections were the most common occupational disease encountered during the surveys. In general the success in controlling dermatitis has been excellent. One member company with numerous cases, some of which were hospitalized, was able to control the hazard completely by following a suggested program providing for reduction of contact with the materials and facilities for thoroughly cleansing the skin. Also, in cooperation with a Pittsburgh dermatologist, new chemical products for possible skin effects were tested. Analyses of a number of products, such as soaps, have been made for member companies.

Another company uses large quantities of synthetic chlorowaxes safely. In past years dermatitis from the chlorowaxes had always increased markedly during the summer. When separate locker rooms for the workers' street clothes and work clothes, with a supervised shower room, were installed no peak of dermatitis cases occurred during the hot weather.

The problem of determination of the free silica content of air-borne dust recurs frequently. It is an established fact that the dust thrown into the air seldom has the same free silica content as the parent material from which the dust originated. While there are several methods for determining the composition of such dusts, reliance is now mainly upon x-ray diffraction analyses for that purpose. Both chemical and petrographic methods have given unreliable results at times. For example, an air-borne dust containing clay with a known quartz content of 35% was found to have only 2% free silica by the petrographic method. An experience in one plant points up the importance of checking the weights of cylinders of liquefied gases upon receipt. In the present case a cylinder which was liquid-full exploded, endangering the lives of nearby workmen. Investigation disclosed that the cylinder contained 18 lbs. more gas than permitted by law. When toxic gases are being used, no cylinder should be accepted which is leaking or which contains more chemical than is allowed by I.C.C. specifications.

A new addition to occupational disease jargon—"angel eyes"—derives its name from the corona effect observed when the workmen look at a light at night after excessive exposure to hypochlorite dust. The effect is caused by a slight edema of the cornea, the fluid acting as a prism.

One result of the war has been to accelerate greatly the production of silica gel, since that chemical is important as a hygroscopic agent and as a catalyst. There was occasion to appraise health hazards in a plant manufacturing quantities of this material. It is curious that silica gel, which is a hydrated form of free silica, has

IN THE RELATION OF NUTRITION TO *Industrial Work-Output*

Work—sustained physical effort, hour in and hour out—results in an extremely high output of energy. To provide for this energy expenditure, the metabolic essentials utilized in the process must be readily available to the organism. If they are not, premature fatigue, both physical and mental, develops, and is reflected in a significant decrease in productivity.

Rest periods alone do not prove sufficient to prevent a physiologic drop in efficiency. In addition to such rest periods, a readily utilized source of caloric food energy, vitamins, and proteins must also be provided. For this purpose, Ovaltine serves admirably. This delicious food drink supplies the nutrients required, leading to rapid replenishment of exhausted bodily reserves.

By adopting the practice of making Ovaltine available at mealtime and providing it during rest periods, a notable improvement in work output may be realized.

The Wander Company, 360 North Michigan Avenue, Chicago 1, Illinois.

Ovaltine

Three daily servings (1½ oz.) of New Improved Ovaltine provide:

	Dry Ovaltine	Ovaltine with milk*		Dry Ovaltine	Ovaltine with milk*
PROTEIN	6.0 Gm.	31.2 Gm.	VITAMIN A	1500 I.U.	2953 I.U.
CARBOHYDRATE	30.0 Gm.	62.43 Gm.	VITAMIN D	405 I.U.	480 I.U.
FAT	2.8 Gm.	29.34 Gm.	THIAMINE	.9 mg.	1.296 mg.
CALCIUM	.25 Gm.	1.104 Gm.	RIBOFLAVIN	.25 mg.	1.278 mg.
PHOSPHORUS	.25 Gm.	.903 Gm.	NIACIN	5.0 mg.	6.9 mg.
IRON	10.5 mg.	11.94 mg.	COPPER	.5 mg.	.5 mg.

*Each serving made with 8 oz. milk; based on average reported values for milk.

shown no tendency to cause silicosis when applied experimentally to animals. Gardner's work, in fact, indicates that its effect is similar to that of inert dusts. The Foundation hopes to develop data on human exposure to silica gel to confirm the results of animal exposure.

The fluoride problem has been encountered in much of the field work. In no case that was studied has the exposure been sufficient to cause skeletal effects, but both skin irritation and nose bleeding were observed.

Tests were conducted in a railroad tunnel prior to the undertaking of some repair work which would keep a number of workmen engaged for some days. Trains passed through the tunnel on an average of once every 15 minutes throughout 24 hours of the day. The tunnel was ventilated, but it was important to determine definitely whether concentrations of carbon monoxide or sulfur dioxide would reach a point where they would endanger the workmen or interfere with the project. It was found that carbon monoxide did not exceed 50 parts per million at any time, which is entirely safe for a complete working day, but concentrations of sulfur dioxide were in excess of acceptable concentrations and definitely objectionable. Accordingly, the workmen were supplied with chemical cartridge respirators for protection during the job.

The methods of micro-analysis of air used in industrial hygiene work are often usefully applied to other plant problems. One such application concerned extensive and serious corrosion of machine and metal products, the cause of which was unknown. With the aid of techniques applied to more usual problems, it was finally proved to be caused by hydrogen chloride from trichlorethylene degreasers. The trichlorethylene was of a poorly stabilized grade which decomposed, releasing acid gas into the shop. It was possible to correct the condition by adopting a better stabilized solvent. Thousands of dollars in cleaning bills were saved by eliminating the cause of the corrosion.

Problems in general air pollution have occupied considerable attention in field studies during the year. Sulfur dioxide, a potential killer of some vegetation when present in sufficient concentrations, and other chemicals, obnoxious in nature, have been the subjects of some investigations. It is anticipated that community air pollution by industrial dusts will receive wide attention after the war.

In one of the studies for measurements of the degree of contamination of a neighborhood by sulfur dioxide, we were able to indicate means, involving metering and controlled dilutions of the gas, which would reduce its consumption to 5-10%. This, obviously, would improve atmospheric conditions within the plant, widen the margin of safety outside, and, simultaneously, show a profit.

Widespread interest has appeared among members in abatement of nuisance of fumes from electric furnaces. There are three practical methods available for the control of such fumes, each with advantages and disadvantages: (1) canopy hoods, which are usually not applicable to the furnaces of smaller capacity, or where the craneway is materially greater than 25-30 feet above the furnace; (2) a sufficiently large volume of general ventilation by means of propeller fans in monitors; and (3) application of local exhaust—the most desirable method wherein the fumes are removed at their source, the base of the electrodes and the firing door. This is by far the most efficient method of all, since it requires much less air flow than either of the other two.

Effects of Heat

LIEUT.-COL. THEODORE F. HATCH presented a paper on "Physiological Effects of Heat."

It is useful and informative, within limits, to consider the problem of man's reaction to heat from a physical point of view. Thus, a man may be described as a kind of heat engine which functions properly only when operated within rather narrow limits of internal temperature. Man's cooling system is far more complex, however, and differs in at least one striking way from that provided in a physical machine. It is highly flexible and can be varied, not only in capacity, but also in the way in which it partitions the heat loss through the several avenues of transfer as the relative capacity of the environment to absorb heat by these various avenues is changed. This capacity of the cooling mechanism to adjust itself to changes in the environment makes it possible for the man-engine to operate successfully over a fairly wide range of environmental temperature, humidity and air movement. It is a matter of common experience, however, that beyond certain limits the apparatus is inadequate and the engine is no longer able to maintain its temperature within the limits essential to proper function. Below the lower or cold limit, the rate of cooling exceeds the rate of heat production and internal temperature is lowered. Above the upper limit, the engine heats up. In the region of excessive cooling the overcapacity of the cooling mechanism is reduced by insulating the engine with clothing, which thus effectively extends the lower limit of the zone of operation. No comparable procedure exists by means of which we may extend the range in the zone of heating, the limit being fixed by physical and physiological end-points. Furthermore, the difficulty and cost of altering the environment to bring it within the performance range of the human engine are greater above the upper limit than in the cold region. Thus it is that the problems which arise in industry from excessive heat may be of greater importance than those associated with operation in the cold.

The bulk of cooling takes place from the skin, only a minor portion of the heat being given off through the respiratory system at normal temperatures and above. Heat is brought to the surface by means of an internal circulatory system, the volume flow of which is altered as required by the thermal demands of the body and of the environment. The transfer of heat takes place along three paths: (1) direct conduction to the air and removal by convection; (2) radiation to surrounding surfaces; (3) evaporation of water from the skin, the water being supplied from within the body by sweating. The total surface area of the body being fixed, it is obvious that the over-all coefficients of heat transfer for these three avenues of heat less are also limited.

Acclimatization—It is well-known that, with continued exposure to heat, man adjusts himself to it so that he is able to work efficiently and safely in an environment which, prior to acclimatization, allowed him to work only with great difficulty and even with danger of collapse. This phenomenon occurs both with moist heat in the region of body temperature and dry heat at temperatures well above body temperature. In both cases, adjustment takes place rapidly, and is completed to a high degree in a week of continuous exposure with graded work. The exact nature of the adjustment has not been fully described. It may be internal, permitting the mechanism to function successfully at a higher internal temperature or with lessened resistance to flow of heat to the surface (improved performance of internal circulatory system). Externally, there may be an increase in the capacity of the evaporative cooling system (concept of increased wetted area). This phenomenon, which has great practical importance to industry, is now under active investigation. Whatever the mechanism of acclimatization may be, the important point to remember is that the acclimatized man is able to work in an environment which lies in the region of maximum permissible heat stress with less danger of exhaustion and collapse than the unacclimatized man.

Water Requirements—The rate of water supply to the evaporative cooler of a heat engine must be maintained at a given level for continuous satisfactory performance. In the case of the man-engine, the water extracted by sweating comes from that stored within the body. For efficient performance the body water content must not drop below a certain minimum level. The rate of water intake, therefore, must be great enough to offset that lost by sweating and to meet other requirements. The amount necessary to satisfy the evaporative cooling demands can be easily calculated, since the cooling capacity per pound of water is a fixed value. On the basis of the calculated values of heat gain by radiation and convection, the following hourly water requirements illustrate the needs of the resting and working man: At 95° F, ⅓ pint of water per hour while resting, 1⅔ pints while

Portrait of a SABOTEUR

One of our smallest saboteurs in point of size is the itch mite. Yet, according to Wise and Sulzberger (1), it is the cause of "one of the most important military and wartime skin diseases."

Like all saboteurs the mite works under cover, burrowing in the epidermis. Here the female deposits her eggs and fecal pellets, the latter believed to provoke the vesiculations of the skin and the excruciating pruritis.

BENZAMOL offers a most effective and agreeable means of eradicating the parasite. Its non-staining character and its pleasant odor make for patient cooperation, and its speedy acaricidal property is gratifying to both physician and host.

SIMPLE TREATMENT

A hot bath, apply BENZAMOL to lesions, allow to dry and apply again, a hot bath and complete change of clothing next morning. Chiggers also succomb to this convenient, economical therapy.

(1) Year Book of Derm. and Syph., 1942.

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Modern Acaracide

SUPPLIED: In three ounce bottles

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working at five times the resting metabolic rate. Similarly, at 115° F, the volumes are one pint at rest, and 2⅓ pints at work.

It has been shown that thirst is not an entirely adequate index of water requirements while working. It is important, therefore, that an attractive supply of water be conveniently located for men working in hot environments in order to insure, so far as possible, the maintenance of water balance. Departure from this state results in inefficient performance and eventual collapse.

Since, in the process of sweating, salt is also lost, the balance of this important component of the body must be maintained by regular intake of salt. The quantity required is roughly proportional to the amount of water taken in. The effect of an inadequate salt balance upon the performance of men in hot industries is well-known and the regular administration of salt is now common practice. The above data on variation in water requirements are of interest in that they show how much the rate of salt intake must be varied with changes in environment. It will be noted that no mention is made of variations in relative humidity in the foregoing illustration of minimum requirements. The assumption is made that the humidity is low enough in every case to insure thermal balance, and that sweating will not proceed beyond that required to achieve this balance. For higher humidities, sweating will continue in spite of the fact that no further benefit is gained. As a consequence, the water and salt requirements will be greater and can no longer be determined from calculations of the amount of water required for evaporation only.

Control Measures in Munitions Plants

COMPLETING the Engineering Section portion of the program, DR. ALLAN D. BRANDT discussed "Application of Engineering Control Measures in Munitions Plants."

This discussion was limited to the explosives processing plants of the Army, since it is in these plants that most of the work has been done. In 1941, it became apparent that unusual problems existed in these plants as regards the application of the conventional engineering measures for the control of atmospheric contamination. The conditions which have been found to present most of the problems are, (1) the explosive nature of the atmospheric contaminants; (2) the nature and location of many of the buildings housing the operations; and (3) the nature of the operations.

A study of these problems led to the conclusion that local exhaust ventilation systems for these plants must fulfill the following requirements if they are to be acceptable from both the industrial hygiene and safety viewpoints: (1) they must contain positive type exhausters such as centrifugal fans; (2) they must prevent the accumulation of explosive materials in the ducts and exhausters; (3) they must permit routine cleaning operations; (4) they must present a minimum of projections on the inside surfaces for the collection of the explosive contaminants, and (5) they must be properly grounded. The key to fulfilling these requirements centers on number (2) since, if it is met adequately, the others are minimized and present no serious problems. Careful consideration of this requirement indicated that it could be accomplished either by locating an efficient collector (preferably wet) at each hood, or by keeping the inside surfaces of all ducts wet, and wetting down the contaminant as well as possible by means of sprays.

Both of these systems have been tried and have been found to operate with complete satisfaction. Where systems with collectors have been used, the collectors have been located adjacent to the hoods or intake grills so that a large percentage of the contaminant is removed from the air before it enters the ducts or fan. Dry collectors are permitted only where the operation performed at or in the hood is such that a spark or detonation is highly improbable. It must be stressed, of course, that wet collectors are preferred and the dry collectors exist more or less under protest. Where wet collectors are used, the water supply and blower are so inter-connected that the blower cannot be operated unless the water is turned on.

In the other type of system which has been found satisfactory water sprays have been provided in each hood and all ductwork from the hoods to the sump slopes downward so that the water from the sprays drains to the sump. In addition to the sprays in the hoods which spray in the direction of air flow, several sprays are located throughout the ductwork in an attempt to get a fair efficiency of contaminant removal and to keep the inside surfaces of the duct wet at all times. A water spray is located directly upstream of the fan and directed into it for the purposes of, first, washing the contaminant from the fan blades and housing, and, second, keeping any material collecting inside the fan so wet that it will resist detonation or combustion.

Another condition which presented new problems in this work is the size and location of many of the buildings housing the operations needing control measures. A fair percentage of the buildings in loading plants are small, of one room and usually one-story type, within which only one operation is conducted. Others are larger but are divided into separate one-room bays by means of barricades. The buildings are generally separated one from the other by considerable distances, and many of the plants are located in flat, open terrain so that air movement is unobstructed. Consequently, in summer when the doors are open, strong breezes are the rule through the buildings and the control velocities must be adequate to overcome the interference created by the natural air movements. Where the equipment requiring control measures is located near open windows, natural air velocities as high as 1000 f.p.m. have been experienced on windy days. Therefore, the control velocities normally recommended for similar operations are inadequate in these plants, and a minimum control velocity of 350 f.p.m. has been found necessary unless the source of contamination is protected by shields, barricades, or equipment. The individual rooms or bays usually house only a single operation, which seldom presents more than two or three major sources of contamination; consequently, the unit system with hoods and collectors at the several sources of contamination tied to a common exhauster located outside the building provides a satisfactory solution.

Many, if not most, of the operations in these plants require the attendance or exposure of only relatively few workers, so that it is sometimes difficult to justify the expenditure necessary for the installation of properly designed local exhaust ventilation systems. Consequently, many of the operations involving excessive atmospheric contamination are enclosed as much as possible, the operators at these jobs are rotated to other jobs involving less or no exposure, and respirators are required for the high exposures to avoid the relatively expensive procedure of installing local exhaust ventilation.

Some of the exposures, even though they are severe and would lend themselves well to control by local exhaust ventilation, are intermittent and of short duration. Consequently, the use of respirators during the periods of exposure appeared to be the most feasible, and certainly the most economical, control method. However, this introduced a new health problem, since most of the materials handled in these operations are severe dermatitis producers, and the incidence of dermatitis on the faces of the wearers where the respirators came in contact was very high. This problem was overcome for the greater part by the use of facelets on the respirators and the frequent renewal thereof (sometimes as often as four times daily); by exceptional personal hygiene; and by appropriate protective creams. On the other hand, where intermittent exposures to high concentrations of TNT were involved, an additional complication arose, since TNT is known to be absorbed through the skin. While respirators would effectively prevent the inhalation of TNT during intermittent exposure to even high concentrations, the exposed surfaces of the workers' bodies and their uniforms were found to be covered with a layer of TNT only a few minutes after beginning work at these operations. Adequate control of the contaminant by means of local exhaust ventilation would reduce tremendously the amount of TNT depositing on the worker and decrease the skin absorption considerably. Therefore, each operation at each plant was found to require individual study to arrive at the most satisfactory solution.

Inasmuch as most of the materials handled in loading

RAPID, LONGER-LASTING RELIEF FOR PEPTIC ULCER

LUDOZAN

(HYDRATED SODIUM ALUMINUM SILICATE)

LUDOZAN Tablets are specially designed to give rapid, prolonged relief in peptic ulcer. *LUDOZAN* is also indicated in heartburn, in pain due to gastric hyperacidity and in alcoholic gastritis.

LUDOZAN forms a true adsorptive, protective gel at gastric pH; buffers excess acidity without alkalosis or 'acid rebound'; is highly palatable, being neither chalky nor gritty; and is convenient to take. *LUDOZAN* is unusual among aluminum compounds in that it is not constipating.

ADMINISTRATION: One to three *LUDOZAN* Tablets between meals, as indicated. Available as *LUDOZAN* Tablets plain, or *LUDOZAN* Tablets with belladonna.

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SPEED UP VICTORY WITH MORE WAR BONDS

plants is explosive, considerable effort in the form of vacuum cleaning of equipment, walls and the like, and washing of the floors and walls is necessary to prevent even a small accumulation of dusts or fumes on exposed surfaces. Vacuum cleaners of the portable industrial type are everywhere in evidence, and are serving a very useful purpose in connection with cleaning of exposed surfaces. The usual type consists of a suitable exhauster with separator (chamber having mechanical filters of the cleanable tube type) located directly upstream of the exhauster and adjacent thereto. In many instances these cleaners have been tied in to permanent piping systems throughout the nearby rooms, to which connection may be made with the flexible rubber vacuum hose for cleaning operations while the motor and exhauster are outside the building proper.

Legal Developments

MR. T. C. WATERS, presented the report of the Legal Committee for 1943, on the subject "Legal Developments in 1943 Respecting Industrial Health." A number of case citations were given which will be available in the complete proceedings of the Foundation.

During the present year the legislatures of 38 states have been in session and in almost all of them there have been bills introduced to amend the state workmen's compensation act. New occupational disease laws have been enacted by the states of Arizona and Oregon, and the existing occupational disease laws of several states have been amended to extend the coverage for occupational diseases, making compensable practically every injury to health that might in any way be related to employment. There is a tendency to recognize the need for medical boards and medical examiners to assist in the administration of these laws. There is also a tendency for administrative agencies and courts to liberalize their interpretations of these laws, with resulting benefits to claimants injured during the course of employment.

New Occupational Disease Laws—Arizona has enacted an occupational disease disability law, effective July 1, 1943. This law provides compensation for 35 scheduled diseases, including asbestosis and silicosis. The maximum benefit under the law is $5,000, and provision is made for a sliding scale of benefits for claims of silicosis and asbestosis.

Oregon has enacted an occupational disease compensation law, effective July 1, 1943. It provides compensation for all "occupational diseases," which term is defined in the act to mean: "Any disease or infection which is peculiar to the industrial process, trade or occupation in each instance and which arises out of and in the scope of employment, and to which an employee is not regularly subjected or exposed other than during a period of regular actual employment therein."

Amendments to Occupational Disease Compensation Statutes—California has amended its workmen's compensation law as follows: "In the case of a member of a police department of a city or municipality, or a member of the State Highway Patrol, when any such member is employed under civil service upon a regular, full time salary, the term 'injury' as used in this division includes heart trouble and pneumonia which develops or manifests itself during a period while such member is in the service of the department, or the State Highway Patrol, as the case may be."

Idaho has amended its occupational disease compensation act to provide for the reference by the Industrial Accident Board to a medical panel for the determination of any controverted medical question. The act further provides that no award shall be made in any case until the medical panel shall have duly investigated the case and made its report with respect to all medical questions at issue.

Maryland amended that part of the occupational disease act relating to enforcement by the State Department of Health and the Commissioner of Health of Baltimore City of provisions for the control and prevention of occupational diseases, making failure or neglect upon the part of an employer to comply with any rule or regulation promulgated by the said Departments of Health a misdemeanor, and upon conviction imposing the fine of $100 for each day of the period that the violation continues.

Massachusetts has amended its compensation act to provide compensation for frostbite, sunstroke and heat exhaustion. Another important amendment is House Bill No. 1769, which grants to an employer the privilege of self insurance under the workmen's compensation act.

Michigan has completely revised its workmen's compensation law and the provisions applicable to occupational diseases have been substantially changed. The maximum compensation for silicosis or other dust diseases is increased from $3,000 to $4,000, and compensation for partial disability from these diseases is denied.

Minnesota's workmen's compensation law has been amended to delete the schedule of compensable diseases and to define compensable occupational diseases.

Nebraska's workmen's compensation law was amended to include compensation for "occupational diseases," which term is defined.

Legislative Commissions:

Kansas passed a legislative resolution directing the Legislative Council to study the advisability and necessity for providing compensation for occupational diseases, and to make a report with recommendations at the next session of the Legislature.

Nevada passed a legislative resolution providing for a study and survey of occupational disease legislation to be made by the Nevada Industrial Commission. No report of the commission has as yet been filed.

In New Jersey a joint resolution was passed by the Senate and General Assembly creating a commission of six members, three from the Senate and three from the House, charged with the duty of making a study, analysis and survey of occupational diseases and provisions of the workmen's compensation laws concerning the same.

In Virginia a Legislative Commission has been appointed for the purpose of investigating the matter of occupational disease legislation in that state, and this Commission is now in the course of completing its report, which will probably be filed at the next Legislative session.

The Foundation's Legal Committee called to the attention of members that the legislative and judical trend with respect to occupational disease compensation is to grant more liberal benefits to employees and to impose upon employers greater responsibilities for the health and care of those who are subject to occupational disease hazards; upon industry rests the responsibility to provide the safe and healthful conditions under which they work. The maintenance of manpower and the preservation of health of employees are one of management's greatest responsibilities and the present discharge of that responsibility will be one of management's greatest contributions to the war effort.

Medical Testimony

MR. J. DEWEY DORSETT, bringing to a close the two-day sessions, gave, in brief fashion, the highlights on "Medical Testimony in Compensation Cases."

It must be remembered that truth is fundamental in all adjudication proceedings, and that it is not the purpose to deny rights of the worker.

Many times the evidence on which a decision must be based is solely medical, and causal relationships, the occurrence of disability and its type also must be considered.

A proper diagnosis is important to the worker, and this importance cannot be overemphasized—the recovery of the worker depends upon a proper diagnosis.

One of the primary requisites in the fair adjudication of compensation cases is the submission of impartial evidence based upon competent knowledge.

The Minnesota experience, known as an experiment, was cited and favorable comment made upon it.

Three classes of medical witnesses were identified: (1) the private physician, who is usually a general practitioner; (2) the impartial examiner (who probably has been the forerunner of the trend in the appointment of medical boards generally); and (3) the expert.

In conclusion, it should be stated that there is one dual purpose in the whole compensation system—to secure the best medical skill available, and to restore the ill or injured employee to his work as early as possible.

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INDUSTRIAL HEALTH and DISEASE

The Married Woman Worker

—Some of the Employment and Health Problems Facing Wartime Employers, and Suggestions for Meeting Them—

IN MANY war plants, even in the heavy industries, the large scale employment of women is already an actuality. Government estimates forecast 18,000,000 women in industry by the end of 1943, 6,000,000 of them in defense plants. The Census Bureau recently estimated a potential reserve of 4,500,000 women for industry, the only remaining large supply of available labor. Of this group 90% are housewives, many of them with small children. They are for the most part unskilled workers who must be given extended training before they are capable of average or better productive efficiency. They are presenting, increasingly, new and special employment problems.

Most of these women also will be compelled to manage households and care for children. Therefore, although belonging to the traditionally weaker sex, they will be required to carry out far more arduous schedules than most of their male co-workers.

Being women as well as workers, they will face the tension, fatigue and discomfort of the menstrual cycle. Being wives, they may from time to time face the problems of maternity and the need for adequate maternity care.

Experience has proved that, despite the demands of her health and home, the married woman worker is on the average, highly efficient. Her responsibilities give her added incentives and a more serious attitude toward her work. But to maintain her well-being and efficiency, adequate steps must be taken to guard her health.

In many industries where large scale employment of married women is still an innovation, personnel policies and plant facilities have not been revamped to meet the needs of this new labor element. Working conditions satisfactory for men are not necessarily applicable to women.

The absentee rate for women has been consistently higher than for men; the national average is a third higher for women. Unless management views with realism this pressing new employment problem, the already high absentee rate for women may move higher, with a consequent drop in output for the future months, overall losses in plant efficiency and added management costs.

Employees an Expensive Investment

THE new woman employee represents a substantial investment of time and training, estimated as high as $500 per worker in some plants. To discharge a woman, as soon as it is known that she is pregnant, as many plants still do, even though she is physically capable of working for several more months, means the complete loss of her services as well as the loss of the investment in developing her job skill. The worry and strain of the women workers who fear dismissal because of pregnancy are also factors which seriously impair efficiency. A liberal policy of letting a qualified physician decide whether the pregnant woman shall or shall not continue to work and for how long, is beneficial to both worker and employer.

Anxiety over the possibility of a child not wanted at this time may slow the worker as much as overexertion during actual pregnancy. For the woman who has not fully recovered from the birth of the last child, or who finds herself unable to support more than her present family, fear of a new pregnancy may have an unnerving result.

Many women workers need their jobs to help support their families. The continuance of a policy of an enforced leave of absence for pregnancy may encourage such a worker to induce a miscarriage or to seek an abortionist as an escape from the unwanted pregnancy, with resulting loss of efficiency in her job and real danger to herself.

Programs to Protect Workers

A COMPLETE maternal health program would protect the worker both during pregnancies and in the intervals between. Conditions within each plant will call for a wide variation of policies. This pamphlet offers some recommendations to guide the formulation of such policies.

(A) EMPLOYMENT OF PREGNANT WOMEN:

In general, personnel policies should recognize that the pregnant woman worker should not be subjected to overlong hours, should be provided with opportunity for adequate rest periods and should not be required to undergo heavy exertion. In view of this:

1. Pregnant women should not be employed on the 12:00 midnight to 6:00 A.M. shift.

2. They should not work more than eight hours a day nor 48 hours a week. A 40-hour week is preferable.

3. They should be given lighter and more sedentary work whenever possible. Types of occupations which should be considered undesirable for them include those which require heavy lifting, continuous standing or moving about, reaching or marked vibration.

4. They should not be allowed to work in occupations which are hazardous for them during pregnancy as follows:

(a) Occupations requiring a good sense of balance, those in which there is a point of operation hazard or those where there is a risk of accidents which might cause severe injury.

(b) Occupations where they will be exposed to toxic substances, such as: aniline, benzol and toluol, carbon disulphide, carbon monoxide, chlorinated hydrocarbons, lead and its compounds, mercury and its compounds, nitrobenzol and other nitro compounds of benzol and its homologs, phosphorus, radio-active substances and x-rays, turpentine, other toxic substances that exert an injurious effect upon the blood forming organs, the liver, or the kidneys.

Certain toxic substances, even when the maintenance of air concentration is within "permissible limit" according to state codes, may have harmful

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effects upon the course of pregnancy, injure the fetus or lead to premature birth.

In general it would seem good procedure for the plant personnel office to make a careful job analysis of the types of occupations to which women employees may be shifted when pregnancy is reported by the employee or the plant physician. The different types of work to which pregnant women may be safely shifted should be listed, and workers should be reassigned to jobs which are related, as far as possible, to their present duties. Attention to this aspect will save the management time and cost in re-instruction and spare the worker too abrupt a readjustment. However, because of the psychological effect upon employees, too many pregnant women should not be placed in any one division.

(B) LEAVES FOR MATERNITY CARE:

The results of a policy of forcing women to take leave immediately when pregnancy is discovered have already been indicated. Enforced leave leads to concealment of pregnancy and slowing down of the worker's efficiency. She will often continue working under conditions which may be detrimental to her health or which may bring on an abortion.

An intelligent policy on maternity leave will include the following:

1. Leave will not be compelled because of pregnancy but granted on a physician's certificate.

2. Provision should be made that the worker's job and seniority privileges will be retained pending her return.

3. The maximum length of leave before and after delivery should depend upon the physical condition of the woman as determined by her physician and upon presentation of the physician's certificate.

4. Minimum length of leave before delivery should be two months. Every pregnant woman should be considered unemployable after the seventh month and not allowed to work longer.

5. Minimum length of leave after childbirth should be two months, if it is essential that the employee return to work. A reasonable extension of or additional leave should be granted on presentation of a physician's certificate when complications occur. Personnel policy should recognize that an infant needs the mother's care especially during the first year of life.

(C) MATERNITY CARE:

In many communities, shortages of physicians and medical facilities have increased the worries of the expectant mother and provided new health risks. Where such conditions exist, management will do well to expand the facilities within the plant to make certain that the health of the employee is adequately cared for or to assist her in obtaining proper care without wasteful loss of time from the job.

Every maternal health program should incorporate these principles:

1. The worker should have access to maternity care from the beginning of pregnancy. When women are given assurance that leave will not be enforced on them upon discovery of pregnancy, they will feel freer to seek medical care earlier.

2. Physicians, nurses and personnel directors should make available to women employees information about maternity care and where such services can be obtained. (A pamphlet on maternity care addressed to women in industry, called "To the Molly Pitchers of This War," is available for distribution from this department.)

3. Regular check-up should be made by management to see that the worker receives adequate medical supervision throughout pregnancy.

4. Every woman, but especially the pregnant woman, should have at least two 10-minute rest periods during her work-shift. Adequate facilities for rest and the obtaining of nourishing food should be provided.

(D) REDUCING TIME LOSSES:

The three elements in maternal health which lead to the greatest amount of absenteeism and reduced job efficiency are menstrual disturbances, abortions and pregnancies. A comprehensive maternal health program can materially reduce productive losses. The following steps are recommended.

1. *Menstrual Disturbances*:

Adequate lounge room facilities, where women may rest for an hour, should be available in every plant. An hour's rest provided during the time of menstruation will frequently eliminate the need for the woman worker to remain at home a day or two each month. Where such rest facilities have been provided, absenteeism from this cause has shown a marked drop.

2. *Abortions*:

If the management takes a positive position in guarding maternal health, if it removes the fear of job loss

What Constitutes a Nutritionally Adequate Breakfast?

Medical authorities and the country's outstanding nutritionists are agreed that the industrial worker's breakfast, regardless of sex, should provide one-third of the day's total food requirement. For optimal nutritional results the morning meal should represent one-third not only of the total caloric need, but if possible of all essential nutrients as well.

The hypoglycemic symptoms which frequently follow an inadequate breakfast, generally are reflected in indications of midmorning fatigue, in a negative attitude toward surroundings and the work itself, and in a work-output which could hardly be called the worker's potential.

The basic or minimum breakfast pattern suggested by nutritionists calls for fruit, cereal, milk, bread, and butter, in quantities totaling about 600 calories; for the additional calories required, it is recommended that eggs, breakfast meats, and other suitable foods be added.

The contribution made by the dish of cereal suggested is evidenced by the appended table. When 1 oz. of cereal (whole-grain, enriched, or restored to whole-grain values of thiamine, niacin, and iron) is eaten with 4 oz. of whole milk and 1 teaspoonful of sugar, this palatable dish contributes protein of high biologic value, readily utilized carbohydrate, well-emulsified fat, B-vitamins and minerals.

Calories	**205**
Protein	**7.0 Gm.**
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Fat	**5.0 Gm.**
Thiamine	**0.18 mg.**
Riboflavin	**0.30 mg.**
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when pregnancy is discovered, if it makes known to its employees that every reasonable consideration will be given to the protection of the pregnant worker, much of the motive for abortion will be removed. Similarly the motive to induce a miscarriage through overexertion will be removed.

3. *Child Spacing*:

Counselors and nurses should see that married women are referred to their physicians or a medical service where they can receive medically supervised scientific child spacing information as a means of protecting the health of mothers and their children.

Many days or weeks may be lost from the job as the result of too frequent pregnancies or pregnancies at a time when a woman is not physically fit for childbirth. The mother, who has not had sufficient time to recover from one pregnancy, finds herself pregnant again. With her home duties, care of a young baby, and her work, she is unable to stay "on the job" all the time.

After a woman has had a baby, she should be guaranteed an interval of at least one year before starting another pregnancy.

The employer considering the advisability of including child spacing in a maternal health program may be concerned with the legality and precedent in doing so. It will interest him to know that:

(a) In every state, except Massachusetts and Connecticut, it is legal for a physician to give pregnancy spacing advice to a patient when her health requires it.

(b) The U. S. Public Health Service supports the inclusion of child spacing in industrial health programs. In the "Outline for an Industrial Hygiene Program" recently published, the Division of Industrial Hygiene of U. S. Public Health Service recommends that: "the counselor should refer married women workers with special problems to the medical service or a private physician for advice on the proper spacing of children, as a means of protecting the health of the mother and her children."

TEN YEARS AGO

—*Continued from page 48.*

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AMERICAN INDUSTRIAL HYGIENE ASSOCIATION
Annual Meeting, St. Louis, Missouri, May 8-12, 1944.

THIS MONTH

—*Continued from page 4.*

gan to happen. It does not esteem that what made him nod is a necessary part of the record. . . . A NEW DEAL newspaper, with the slogan "The Truth, the Whole Truth, and Nothing but the Truth," says editorially that the Wagner-Dingell bill provides for a national health insurance fund "administered by the Surgeon-General, with an advisory council appointed by the medical associations." The text of the bill, of course, says that the advisory council is "to be appointed by the Surgeon-General from a panel of names submitted by professional and other agencies and organizations concerned with medical services and education, with the operation of hospitals, and from among other persons, agencies, or organizations

—*Continued on page 118.*

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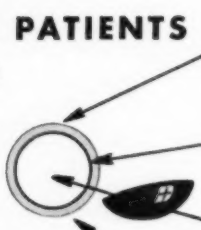

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Industrial Medicine

Reg. U. S. Pat. Off.

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The Science, the Law and the Economics of Industrial Health

Volume 5 | January, 1944 | Section I

The Physical Examination

PHYSICAL examinations are of undeniable value in the furtherance of general health and the prevention of occupational disease, as well as in the proper placement of the worker, the early detection of ailments, and the bringing to light of deleterious effects of working conditions.

It is our belief that there is general acceptance on the part of well-informed, fair-minded persons that the physical examination of industrial workers is fundamentally desirable. This examination is utilized to great advantage in many plants all over the country. Why then is it not more universally applied?

Four causes are perhaps the most prominent: (1) the lack of appreciation of the value of physical examinations; (2) the cost, coupled with the thought that it exceeds value received; (3) present lack of qualified physicians; and (4), most of all, apprehension.

The first three of these causes will, we believe, take care of themselves, but the fourth will require much constructive attention in order to overcome it.

Apprehension over possible labor unrest and a flood of occupational disease claims which might follow the inauguration of a physical examination program have deterred many a concern. Apprehension that the physical examination will be used as a device for refusing employment to, or discharging, men active in labor movements has caused labor unions and others with an interest in labor to object vigorously to its use.

In regard to the apprehension of the employer, it has been our observation that the making of physical examinations by a concern which has an honest interest in the welfare of its workers tends to improve industrial relations. The doctor and the nurse with the proper point of view have a real opportunity to instigate and maintain a desirable attitude between the worker and the employer.

When it was believed a number of years ago that the disclosure by physical examination of the presence of such occupational diseases as silicosis meant that the worker should be discharged, or that he would soon become disabled, there may have been some sound reason behind the apprehension that occupational disease claims were sure to follow. With the proper handling of the results of physical examinations, there should not be, and in the considerable number of cases which have come to our attention there has not been, any such opening of the gates. With present methods of occupational disease control, conditions presenting excessive health hazards can be taken care of, and, only rarely need there be transfer of the worker who has shown signs of incipient poisoning to some other job.

The apprehension of labor elements that physical examinations will be used to their detriment can be overcome only by demonstration on the part of individual employers that fair dealings are to be expected. If a worker fails to have confidence in his ordinary relations with his employer, he may not voluntarily submit to a physical examination, as he may believe that the results will be used to his disadvantage. The benefits of physical examination to such a worker become a mere academic discussion unless some procedure can be developed to assure him that it does not *per se* place in jeopardy his means of livelihood.

It is our contention that those interested in furthering the welfare of labor should accept the proposition that the physical examination is to the great benefit of labor. They should lend their efforts to the introduction of a physical examination program, even though they must always be mindful that adequate attention be given to avoiding the evils which can creep into such a program.

It has always been the American way to carry a good idea to its completion for the greatest good of the largest number of people. Obstacles have never been permitted to stand in the way of a really desirable project. In the general program of physical examination, its tremendous benefits should not be submerged in a fog of incidental objections, however real these may be. The point of view which should be adopted is that, though every effort should be made to overcome objectionable features, a program as advantageous as that of the physical examination should be accorded whole-hearted support.

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INDUSTRIAL MEDICINE, Industrial Hygiene Section: Official Publication of the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION, H. H. SCHRENK, PH.D., President; J. J. BLOOMFIELD, President-Elect; EDGAR C. BARNES, Secretary; J. B. LITTLEFIELD, Treasurer: Published in January, April, July, and October: Editor, WARREN A. COOK: 605 North Michigan Avenue, Chicago.

Sampling and Analysis of Air Contaminants

—Methods in the War Industries—

F. H. GOLDMAN, Ph.D.,
Senior Chemist, National Institute of Health, Bethesda, Maryland

THE WAR has brought with it greater demands for all industrial hygiene activities. Entirely new problems have arisen, particularly in the war industries. Potential health hazards are to be encountered in operations involving the manufacture and use of all types of material such as explosives, war gases, paints, solvents, synthetics, and chemicals.

During the last war it was found that persons exposed to TNT dust and vapors became seriously ill. Scientific investigations were undertaken, both here and in Great Britain, and a method was developed for the detection of TNT in air.[1, 2] However, once the war was over interest in this subject died down completely, only to be revived again in our present emergency. This time we had not only TNT to engage our attention but also tetryl, PETN, nitroglycerine, mercury fulminate, lead azide, and many others.

One feature of the problems with which we are confronted is our inability to apply existing standard procedures to them. The sampling method in itself may

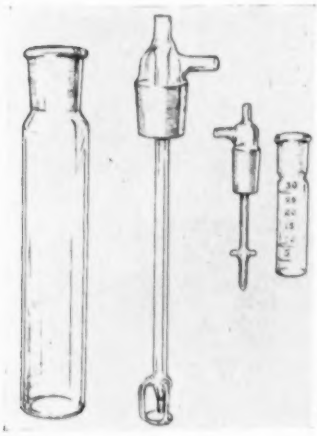

Fig. 1.

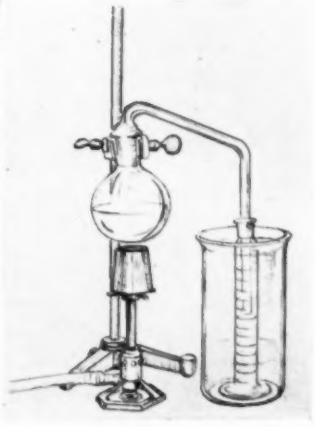

Fig. 2.

constitute a hazard. For instance, in sampling vapors and dusts no electrical equipment may be taken inside the plant, owing to dangers from sparking, and static electricity. Glass apparatus must be especially protected from breakage. Alkalis are forbidden because of their sensitizing effect on many explosives, hot combustion tubes may not be used owing to the presence of combustible vapors, and so on down the line.

The Greenburg-Smith impinger was developed at the Bureau of Mines in cooperation with the U. S. Public Health Service in 1922. It is primarily a dust sampling apparatus but it has also been used as a gas absorption bottle or bubbler, especially where the collection of very soluble gases is concerned. The use of this same apparatus for more than one purpose is very attractive in the field when apparatus can only be shipped or carried along under great difficulties. This impinger could not be used in many plants because of its bulk, weight, and power requirements. However, a smaller instrument known as the midget impinger was developed and described in 1937.[3]

Fig. 1 illustrates these instruments. The large impinger stands 16 inches tall and is motor driven. The capacity of the impinger flask is 500 ml. and 100 ml. of fluid is required for its operation. The small impinger is seven inches long and is powered by a hand-cranked pump. The impinger flask has a capacity of 30 ml. and only 10 ml. is required for its operation. This is the instrument which has been taken into ordnance plants, arsenals, etc., for sampling the atmosphere.

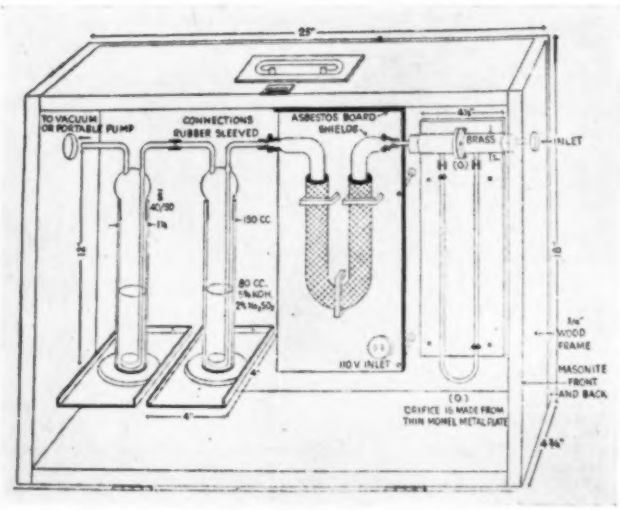

Fig. 3.

The midget impinger has also been modified so as to make it an efficient bubbler. Besides being designed with interchangeable ground glass joints (the original impingers were rubber-stoppered), fritted glass bubblers have been attached.

These modifications have made it possible to collect various gases and vapors in aqueous and non-aqueous reagents and in a small volume of reagent at a sampling rate of from 1-3 liters per minute. The sampling rate of the large impinger is 28 liters per minute.

Some of the air contaminants which have been collected in this way include ammonium picrate, dinitrotoluene, tetryl, TNT, nitroglycerine, mercury fulminate, tracer bullet mixtures, fluorides, metal fumes, chlorinated hydrocarbons and war gases.

The estimation of TNT in air is usually based upon the color which is produced when non-aqueous solutions of the compound are made alkaline.[4] One such method is carried out by collecting the sample in ethanol, transferring it to a Nessler tube, adding alcoholic potassium hydroxide and reading the pink colors which are obtained against suitable standards.

Another procedure is to collect the TNT in diethylaminoethanol.[5] The purple color develops immediately since the basic nature of the collecting medium makes the addition of alkali unnecessary. The colors obtained are extremely stable so that reference curves may be prepared for use with the spectrophotometer.

Other methods for TNT have been based on the reduction of the nitro groups involving titration with titanium chloride, or diazotization and subsequent colorimetric determination.[6]

Other substances such as dinitrotoluene (DNT) behave very similarly to TNT and produce a violet coloration in alcoholic potassium hydroxide. These two compounds can be distinguished, however, by the fact that DNT will yield a blue-green color in diethylaminoethanol, but only when made strongly alkaline. In the absence of added alkali the solution remains colorless.

Nitroglycerine has been collected in triethylene

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glycol. It is hydrolyzed in 62% sulfuric acid and the nitrate is allowed to react with the xylenol reagent which is added. The nitroxylenol is distilled over into a Nessler tube or graduated cylinder and yields an intense yellow color in alkaline solution.

Other nitrate esters such as PETN may be determined by the same method.

Tetryl is collected in an acidulated aqueous medium and it is then determined by making this solution alkaline. The orange color which forms begins to fade rapidly, but comparisons may be made with appropriate color standards.

These nitro compounds behave like indicators. They are strongly colored in alkaline solution and are colorless in acid solution. This reaction is usually reversible. These compounds are also less stable on the alkaline side, and a substance such as tetryl readily hydrolyzes to picric acid and methylamine. That is why it is best to collect tetryl in an acid medium and add the alkali when ready to make the color comparison.

In the case of tetryl it is a great advantage to be able to use diethylaminoethanol as the collecting medium. Here again addition of alkali is not required to develop the wine red color which is obtained. Unlike TNT this color does fade slowly, but the fading may be measured in weeks rather than in minutes. This enables references curves to be prepared for use after various periods of time have elapsed. The colors may then be read on the spectrophotometer. Fortunately tetryl and TNT are usually not found together in the atmosphere, since both give very similar color reactions with diethylaminoethanol.

Ammonium picrate has been collected in water, and the colored solutions have been compared with a set of standards made up from a stock solution of this salt.

Another method is to add alkali and distil over the ammonia. The latter is determined in the same way as Kjeldahl nitrogen.

Mercury fulminate is collected in ethanol and the mercury estimated by the dithizone method. Other metallic cations, particularly lead have been analyzed by dithizone methods. Spectrographic analysis has also been used in these cases.

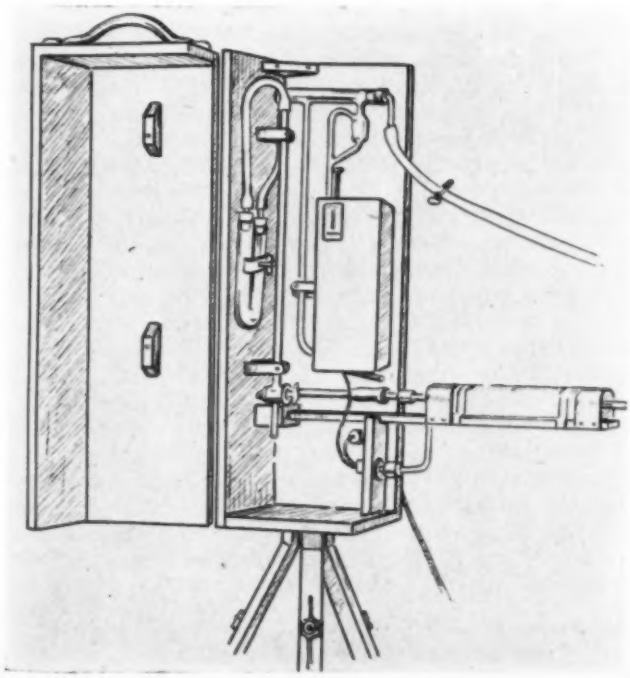

Fig. 4.

Chlorinated solvents are usually estimated by passing the vapors through a hot combustion tube containing platinum as a catalyst. The hydrochloric acid which is formed is determined in the usual way.

However, these compounds may occur in the air together with other solvents and form an inflammable mixture. In such cases these vapors have been collected in amyl acetate using two midget fritted glass bubblers in series. The amyl acetate is then burnt in a small cone flask equipped with a cigarette lighter wick.

The products of combustion are caught in a sodium carbonate-arsenite solution, and chlorides are determined. Procedures for war gases follow the same general lines; the collecting medium and the analytical method depend, of course, on the nature of the particular compound.

These are just a few examples of methods involving the use of midget impinger and similar bubbler-type

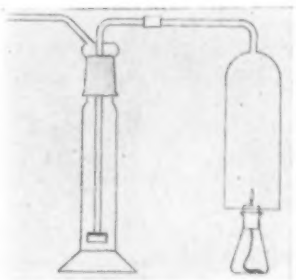

Fig. 5.

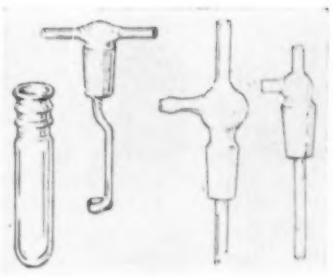

Fig. 6.

apparatus. It should be mentioned here that there is a great need in the field of industrial hygiene for a manually operated pump strong enough to overcome some of the resistances usually encountered with fritted bubblers of fine porosities, especially when it may be necessary to use them in series. It should also be more readily adaptable for changes in air flow velocities. The usual sampling time for collecting vapors of tetryl, TNT, etc., has been about 10 minutes at 1-3 l.p.m. The allowable limit of TNT in air has been fixed at about 1.5 mg. per cu. meter. These values determine the order of magnitude of the quantities actually determined in the laboratory.

Another type of collecting procedure is the "grab" sample method. This method is particularly useful for gases, such as welding fumes and fumes from gunfire which cannot be trapped efficiently by bubbling through divers liquids. Various types of flasks and tubes have been designed for this purpose. Fig. 6 illustrates some of the apparatus.

The Shepherd bottle, Fig. 7, has been adapted for collecting contaminants such as nitrogen oxides and benzene. In the case of nitrogen oxides the bottle is evacuated and sealed by giving the cap a half turn. When ready to take the sample, the cap is turned to the open position and is filled with the air sample. The cap is removed and about 10 ml. dilute sulfuric acid plus a few drops of hydrogen peroxide are introduced after which the bottle is again closed. The inner wall is wetted with this reagent by rotating the bottle and then after standing for a sufficiently long period (sometimes overnight) the contents of the bottle are analyzed by the phenoldisulfonic acid method for nitrate. Fig. 8 illustrates an additional modification.

In the case of benzene in air 10 ml. of nitrating acid is introduced into the flask. After standing a few hours the benzene is nitrated to m-dinitrobenzene and may be determined colorimetrically or by titration with titanous chloride.

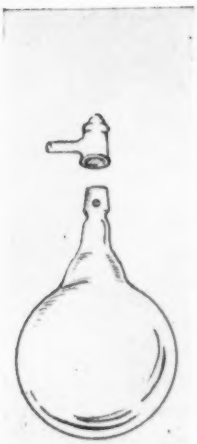

Fig. 7.

Fig. 8.

Fig. 9.

There may also be cases where it is necessary to perform a distillation as in the xylenol method for nitrates. Such distillations are most easily made by using the collecting bottle as the distilling flask by a suitable interchange of ground glass connections.

A recent grab sampling technique is the use of a hypodermic syringe for sampling and analysis.[7, 11] This has particular application where small volumes of gas samples are sufficient. Patty has used these syringes for the determination of nitrogen dioxide in air. The reagent is introduced into the syringe followed by the air sample. The color which is developed is compared directly in the syringe with a set of color standards.

Electrostatic Percipitator

ONE of the best methods for collecting dust and fumes is by means of the electrostatic precipitator. This instrument consists essentially of an aluminum tube 3.7 cm. in diameter and 19 cm. long, in which a platinum wire is centered. The tube and wire act as the electrodes. Air is passed through this tube at 85 liters per minute (3 cu.ft/min.) and the sample is deposited on the inner surface of the tube. Lead fumes and dust, fluoride fumes, and a number of other dusts have been collected in this way.

Special Instruments

A NUMBER of instruments have been designed for detecting specific contaminants in the industrial atmosphere. Among them are the mercury vapor detector[8, 9] and the Benzol Indicator.[10] These instruments are particularly interesting because of their adaptability for sampling various other substances. The mercury detector as designed by Woodson consists of an ultra-violet lamp which serves as the light source and a photo-electric tube which registers the intensity of the light striking it. Interposed between the ultra-violet lamp and the photo-cell is a tube of fixed dimensions which contains the air sample. Since the light emitted is mainly 2537 Å and since mercury vapor absorbs strongly at this wave length the presence of mercury vapor in the sample causes a certain amount of opacity which may be recorded.

According to the principle by which this instrument operates any vapor which absorbs in the same spectral region will give a response. Accordingly Hansen has designed the tri-per-analyzer for the detection of tri- and perchloroethylene. Aside from certain differences in circuit and design the instrument works on the same principle as the Woodson detector. Other compounds to which this instrument is sensitive are tetraethyl lead, xylene, aniline, phosgene, gasoline, carbon disulfide, etc. The detector is simply calibrated to read in terms of the particular contaminant that is to be estimated.

In a similar manner the MSA benzol indicator may be adapted for the estimation of solvents such as ether, esters, gasoline, toluene, etc. The "benzol indicator" is essentially a combustible gas indicator calibrated in terms of benzol. It operates on the principle of the Wheatstone bridge. The gas sample flows over a hot wire which is part of the balanced electrical circuit. The combustion of the gas causes an increase in resistance which is registered on a galvanometer.

In order to use this indicator for a solvent vapor other than benzol, such as naphtha, it is necessary to calibrate the instrument. Known amounts of the solvent are volatilized in a suitable chamber and the air mixtures are checked with the indicator. In this way a curve is obtained which gives say milligrams of naphtha per liter of air versus "benzol indicator" reading. However, it is customary to record such concentrations in p.p.m. by volume rather than by weight. If this were a pure compound this conversion could be performed very simply if the molecular weight was known. In the case of a substance like naphtha the vapor density is determined in a Victor Meyer type apparatus and the "apparent molecular weight" is used for the calculation. Incidentally, the laboratory work involved in such determinations is quite simple and requires little time.

In addition to the methods already mentioned, spectrographic, polarigraphic, and even x-ray diffraction methods are being applied to these problems. Spectrographic methods have been particularly successful in determining minute amounts of mercury and lead using the graphite arc. Alkaline earths are used extensively in flares and tracer bullets. Minute amounts of these elements are extremely difficult to analyze chemically. However, by using the spectrograph they may be determined readily.

The identification of benzol, toluol and xylene is extremely difficult when present in air in concentrations of about 100 p.p.m. This is quite an important problem since these aromatics have a very high toxicity compared to that of the other petroleum hydrocarbons such as the paraffins and naphthenes. Benzol is the most toxic of these three aromatics and, although we have very sensitive methods for identifying these compounds as a group, the identification of each specifically is quite difficult. However, this has been accomplished quite nicely by absorption spectroscopy. The air sample is collected in a flask modified as in Fig. 9. The sintered plug makes a mercury seal, since it allows air to pass through it but not mercury. In practice the flask is evacuated and sealed off. When a sample is to be taken the end is snapped off and the flask is filled. The test-tube containing mercury is now slipped on and the seal is complete. In the laboratory the sample is transferred to a glass tube with quartz windows. The spectrogram is then obtained with a medium size spectrograph using a hydrogen tube as a continuous light source. The line intensities are then read with a densitometer. Benzol, toluene, and xylene may then be identified and determined when present in concentrations as low as 5 p.p.m.

Polarigraphic analysis has been applied to metallic elements such as lead and zinc and organic compounds such as formaldehyde. X-ray diffraction is being applied to the estimation of quartz in various dusts and is particularly helpful in the examination of clays, shales and talcs.

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Control of Welding Fumes

—In Shipbuilding Operations—

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THE tremendous shipbuilding expansion on the Pacific Coast has given rise to a number of problems concerning the control of welding hazards associated with the construction of these ships. These problems have been especially acute owing to the fact that riveting of ship seams, bulkheads, and compartments has been almost entirely replaced by electric arc welding. This paper will attempt to deal only with the major fume hazards of welding operations and the control measures which have been instituted by the Division of Industrial Hygiene of the Los Angeles City Health Department with the cooperation of some of the shipyards situated in the Los Angeles City area.

The major health hazards associated with electric welding operations can be classified briefly as follows:

1. Eye injuries, burns, or irritations due to the brilliant rays of the electric arc.

2. Skin injuries and burns due either to ultraviolet radiation of the electric arc or through the handling, sparks, or drops of molten metal.

3. The respiratory hazards due to the generation of poisonous gases and fumes.

It is with this latter group, the respiratory hazards, that this Division has been most concerned. The control of eye and skin injuries due to the welding arc has been widely appreciated by safety engineers, and in most plants and yards adequate control measures have been installed by means of suitable personal protective equipment in the form of goggles, welding helmets, face shields and special clothing. However, the large number of "eye burns" and "conjunctivitis" reports which this Division receives each month from the occupational disease reports of the State Industrial Accident Commission, occurring among "passers-by," helpers, foremen, and adjacent workers, from welding "flashes," reveal that more attention should be given to the control of this problem. In yards and plants this can be accomplished either through the provision of portable opaque screens surrounding the welder, or, better still, the construction of permanent or portable welding booths. Care must be taken regarding the painting of the interior of an arc welding booth, since a paint that reflects the rays of an arc may subject the welder to eye flashes from the side and back of the face shield. A simple, non-glossy paint for this purpose is composed of zinc oxide, oil and turpentine, to which may be added emery dust or sand to give a non-reflective surface, and which may be given a desired dark tint with lamp black. The adequate ventilating of booths and screen-enclosed areas must be considered.

The respiratory hazards due to electric arc welding include poisonous substances that may be volatilized by heat, such as lead, cadmium, and zinc fumes from the welding of galvanized or painted plates; poisonous gases, such as oxides of nitrogen, which may be generated by the arc or by faulty combustion, and the hazard which may be associated by the exhaustion of oxygen in the air which may occur in the closely confined compartments and bulkheads commonly associated with ship construction. Fortunately, cases of illness due to oxygen depletion are surprisingly rare, and it is the first two classes of respiratory welding hazards upon which the attention of industrial hygienists should be focused.

Investigations by this Division of welding operations in shipyards revealed two separate and distinct problems. They were, first, the welding which was conducted on black iron, and second, that welding which was done primarily on galvanized and other coated steels. Past experience has indicated that the primary hazards of welding on galvanized iron are lead and zinc fumes, and that the concentration of these two substances is the most satisfactory index of the relative hazard of the welding operation.

Air studies for the collection and analysis of welding fumes were conducted in two major shipyards. One of these yards did the greater part of its welding on galvanized steel, during which air samples were taken for the concentration of lead, zinc, and oxides of nitrogen fumes. In addition, carbon monoxide determinations were made. The other yard welded primarily on black steels for which the same determinations were made. Samples were collected with both the Greenburg-Smith impinger in dilute nitric acid, and the electrostatic precipitator. The collected samples were analyzed in the chemical laboratory of this Division in accordance with the methodology recommended by the U. S. Public Health Service. All air samples were collected in an area adjacent to the rear edge of the welder's helmet, since it was believed that this would be most representative of the air the welder would be most likely to breathe.

As established in the Dusts, Fumes, Vapors and Gases Safety Orders of the Industrial Accident Commission of the State of California, the maximum permissible concentration of lead fumes which may be breathed over an extended period of time is 1.5 milligrams of lead per 10 cubic meters of air. For exposure to zinc fumes, this value has been established at 150 milligrams of zinc fumes per 10 cubic meters of air. No value for the maximum permissible limit for iron oxide has been created, but the limit of 300 milligrams per 10 cubic meters, as suggested by Drinker,[1] has been used by this Division as the maximum index of fume contamination.

The result of our air sampling and analyses in the shipyards studied revealed that, where no control measures in the form of exhaust equipment were used, potentially toxic concentrations of metallic fumes, primarily lead and zinc, were being released from welding operations on galvanized steel. In the instances where electric welding was being done on ungalvanized materials, no lead and zinc fumes were found, but very high concentrations of ferric oxide dusts and smokes were obtained. Associated with these high concentrations were reported a number of illnesses of a respiratory character. This experience has also been reported by other health authorities throughout the country. Although no positive medical findings were established upon the examination of these men, nevertheless, the occurrence of temporary disabling illnesses among electric welders on ungalvanized steels indicates the necessity of controlling the dissemination of these fumes into the breathing environs of the welders. It has been our experience that if the con-

centration of ferric oxide fumes is used as an index of fume concentration and kept below 300 milligrams per 10 cubic meters of air, as suggested by Drinker, no toxic results to the breathing of the welding fumes will occur. Samples taken for the presence of nitrous oxide fumes and carbon monoxide were generally negligible. In no instances were samples taken under conditions where oxygen depletion might possibly have been a factor.

Having established the fact that a potential health hazard existed, the next step was to devise and install measures for the control of the fumes. This problem of shipbuilding ventilation was first presented to this Division in August, 1941, by one of the largest shipbuilding firms in Southern California. There were in general use various methods of decreasing the respiratory exposure to welding fumes, the choice of method depending upon the type of welding being done, the location or confinement of the welding operations, the material which was being welded, the type and kind of welding rod used, the duration or amount of welding, and the concentration, kind and toxicity of fumes and other substances being produced.

Accordingly, it was decided to make control experiments in order to determine some of the fume concentrations which might be expected when actual operations were commenced, and to determine what control measures might be most efficiently incorporated. A special tank was constructed by the company, 6 x 6 x 6 feet in size, with a 16-inch circular opening simulating as much as possible some of the conditions which might be met during the welding of double bottoms and in enclosed spaces. Welding samples were taken inside this tank on galvanized steel, ventilation being provided by a rated 700 c.f.m. exhauster through a 3-inch port with 50-foot sections of flexible canvas tubing. It was found that the air delivery of the system was about 450 c.f.m. Without any exhaust ventilation, the average concentration of lead fumes in the tank was 44.0 mgm. per 10 cubic meters of air. Analysis for the zinc content showed concentrations as high as 1020 mgm. per 10 cubic meters of air, with traces of nitrous oxide being present. With the introduction of the exhaust duct 10 to 20 inches from the arc, the lead concentration dropped to 1.6 mgm. per 10 cubic meters of air; zinc to 18.2 mgm. per 10 cubic meters of air, and no traces of nitrous oxide were found. When the mouth of the exhaust duct was placed 6 inches from the arc, the lead fume concentration was 0.44 mgm. per 10 cubic meters of air; zinc fumes being 9.2 mgm. per 10 cubic meters of air. As a result of these experiments and further tests during actual shipbuilding construction it was shown that the most satisfactory method of control of galvanized welding fumes was by local exhaust ventilation. Either 3-inch or 4-inch flexible metal or heavy fabric tubing was used between the welding operations and the exhauster. The exhauster is situated as close to the welding operations as possible, in order that the resistance of the duct work be kept at a minimum.

The disadvantages of this method are, first, that the welder will have a tendency to allow the tube to be further than 9 inches from the arc as he welds along a seam, unless he has a helper to maintain the minimum distance of six to nine inches; secondly, a safety hazard is presented through stumbling or tripping, and care must be taken to avoid this. In general, however, its efficiency in removing virtually all the fumes, its relative ease of handling after the welder becomes accustomed to it, and the elimination of the use of all personal respiratory protective equipment, makes it the most satisfactory and effective method of controlling welding fumes.

The use of local exhaust systems is not necessarily restricted to confined or enclosed spaces, but has also been adopted as a method of control in pre-fabrication plants where welding is performed. The type of control most suitable for welding operations in these plants where the welding location is permanent or semi-permanent, is the installation of a portable moving type of exhaust hood attached to a flexible hose, which is in turn attached to a swiveling body firmly mounted to a wall or post. The exhauster is attached from a permanent location. The installation of small, high velocity exhaust booths has been also found to be very satisfactory for permanent installations in pre-fabrication plants.

It was also found that after the installation of such local exhaust equipment, the working time and efficiencies of the welders were very noticeably increased. It was common practice for the men to weld for continuous periods varying from 10 to 20 minutes during which a large accumulation of smokes and gas was built up, requiring the men to stop the welding until such smokes were dissipated, which would be for periods varying from 10 to 15 minutes, after which welding was resumed. After exhaust equipment was installed, the men were found to weld for longer periods of time and rest for shorter intervals, ordinarily just enough to "have a smoke." The economic return to the companies of such increased production has been realized and appreciated by the plant managements.

The primary function of the local exhaust equipment was to remove the contaminating dusts, fumes, and gases at their point of origin. It was found, however, that some consideration should be given to the problem of supplying adequate outside fresh air. To this end, therefore, a large system of semi-permanent air-supply ventilation through 12-inch ducts supplied by blowers 7000 c.f.m. capacity were installed throughout the ships. Details of this construction are well described in an article by H. E. Packard, safety engineer.[2]

It must be mentioned, however, that the use of general ventilation alone is recommended for only those areas where it is desired to provide fresh air because of potential contamination of fumes or other materials from adjacent areas, or where, because of the location of the operation, it becomes necessary to insure fresh air. Caution must be taken in using general supply ventilation alone where actual welding operations are being done. First of all, very little dilution takes place between the source of the fumes, i.e., the arc, and the breathing level of the welder, since, at far distances from the welder, the "reach" of these blowers may become negligible, either to short circuiting, friction losses, etc.; secondly, it is difficult and impractical many times, to attempt to attain the large volumes of air which may be necessary in order to lower the fume concentrations by dilution alone.

It must be kept in mind, that all the foregoing discussion has been with welding on galvanized metal where the hazard to the breathing of lead and zinc fumes is so important. With respect to the welding on black iron, the problem is not so acute, owing to the fact that there are relatively no lead and zinc fumes. Numerous samples taken by this Division substantiated this. Although this Division has recommended the type of local exhaust ventilation described above for all types of electric arc welding, regardless of metal welded, it was decided, in another yard where welding was primarily done on black iron for Liberty

ships, that a ventilating system which would provide general ventilation for the total work area of each hull through the entire construction period would be more feasible and easier to operate because of the short time of ship construction involved.

In this yard a system was designed where each blower is permanently located until a job is completed. Several hundred blowers equipped with a 5 H.P., 4-pole, 3-phase, splash-proof motor turning at 1750 r.p.m., and each capable of handling 7500 c.f.m., are used throughout the ships. The average outlet velocity at the orifice is approximately 5000 f.p.m., which is necessary in order to transport the larger volumes of air required. Where necessary, ducts are used, the maximum size being 16 inches in diameter. For the proper placement and handling of all ventilating equipment a crane schedule has been worked out and an Expediting Department established. A manual with this schedule included has been distributed to the crane operators whose duty it is to lift the ventilating equipment aboard the hull in sequence with the installation of deck sections. The Expediting Department follows an erection schedule for each hull and sees to it that blowers and other equipment are available when the crane lifts are scheduled. It is also the responsibility of the Expediting Department to keep a complete record of each blower, and to check daily reports to make sure that each unit is being used according to plan. Profile blueprints have been made of each ship under construction, and the location of all ventilating equipment is noted daily. This system avoids the confusion with regard to the placement and location of all ventilating equipment that heretofore had been prevalent, and up to this date appears to be working very satisfactorily.

The use of respirators either of a supplied-air or cartridge type, or supplied-air welding helmets is often suggested by management as a personal control procedure. Cartridge type respirators approved by the U. S. Bureau of Mines for exposures to certain welding dusts and some fumes are available and may be used advantageously under certain conditions. At best, however, respirators are recommended but for emergencies and for daily exposures of short duration, and should not be considered a substitute for an adequate control system where the worker is exposed to the fumes for any long duration of time. Respirators are not recommended for constant day-long use for many reasons, some of which are as follows: (1) workers will not wear them continuously during the entire working period; (2) frequently they are not worn properly; (3) the filters are not always kept in good condition and changed as required; and (4) their use under a welding helmet is cumbersome, uncomfortable, and irritating to the workers. The continued use of respirators is to be discouraged and is an admission of failure on the part of the plant to control the hazard. Recommendations for respirators of any type should be made only if control by ventilation is impractical. For welding operations in confined compartments and small enclosures, supplied-air respirators have been, and are being used to a limited extent. Their advantage lies in the fact that they provide positive protection for the wearer. Air-fed welding helmets have been employed, but their protection is limited. Inside this helmet a curtain of fresh air is distributed across the glass through slots or jets. However, there has appeared in a recent issue of *J.A.M.A.* a discussion of a new type of air-fed welding helmet which the authors claim will offer complete protection against the breathing of welding fumes. A large plant in Southern California has been experimenting with this new type of helmet, and indications seem to be that it is satisfactory.

In conclusion, it might be mentioned that, as a result of our studies and recommendations in the shipyards studied, the incidence of complaints and illnesses due to welding fumes has dropped considerably, until at the present time this is no longer considered a major hazard. In two shipyards alone, more than $350,000 has already been expended for ventilating equipment.

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Wartime Industrial Hygiene

— Abstracts of Proceedings of the Industrial Hygiene Section Meetings, Wartime Public Health Conference and 72nd Annual Business Meeting, American Public Health Association, New York, October 12-14, 1943—

Reported by

C. O. SAPPINGTON, M.D., Dr. P.H.

DISCUSSING the wartime needs and problems of industrial hygiene, as well as other phases of preventive medicine and public health in industry, the Industrial Hygiene Section meetings of the 72nd annual meeting of the American Public Health Association afforded a great variety of material.

The first meeting considered postwar problems, medical service in war industry, chemical and toxicological phases, and also convalescent and rehabilitation training programs; the second meeting was a joint session of the Industrial Hygiene, Food and Nutrition, and Public Health Nursing Sections, with a consideration of nursing and nutrition problems in industry; the third session considered specific industrial hygiene problems, such as air sampling devices, sterilization of air, luminous dial painting, and industrial noise; and the fourth meeting was a joint session of Industrial Hygiene and Health Officers Sections, including discussions of coordination of health departments, small industries, the private physician, procurement and assignment, and chamber of commerce health programs.

Industrial Hygiene—Postwar

DR. JAMES G. TOWNSEND gave the chairman's address on the subject "Industrial Health in the Postwar World." It was stated that the discussion would be confined to the subject of postwar industrial hygiene.

Postwar planning has been a sort of free-for-all. There is not much to go on in the way of statistics. The U. S. Public Health Service has some figures on a number of reporting industries with regard to the incidence of sickness; there are no real data on the occurrence of occupational diseases. Moreover, there are no data available on the total national cost of industrial health services, although there are a few scattered reports to be found.

Industry will be faced with new operations and new materials in the postwar era; consideration of the returning handicapped will be a problem, and the U. S. Public Health Service has made a survey of 2500 jobs for handicapped workers. The active integration of industrial hygiene with postwar rehabilitation measures should be started now.

Among closely related subjects is the consideration of the human factor in the causation of accidents, and the selection of flight personnel, which has its industrial hygiene implications.

Among the technical problems which are of importance are the manufacture of plastics and synthetic rubber, welding operations, and the fabrication of light metals.

The means by which postwar industrial hygiene problems can be solved present a specific avenue of approach; there is considerable lack of trained personnel, and preparations should be made now for further intensive training; there is a great lack of industrial hygiene services generally speaking, although manufacturing and laboratory groups know something about them.

The extent to which the services may be applied specifically depends on more adequate financing of properly designed and maintained preventive services—these items should be on state agenda. Approximately 67% of the present services are financed by the Federal government.

State services which are now in existence form a spearhead for future activities in public health in industry; 10 states have no such services at present.

Finally, emphasis should be placed on the importance of industrial hygiene activities being included in international postwar plans.

Emergency Medical Service

DR. WARD L. MOULD discussed "Community Emergency Medical Service in War Industry."

Prior to the war there was no central point in a community to which the industrial physician could appeal for medical service in an emergency. Perhaps he called hospitals for ambulances, physicians, and nurses, or he appealed to the police or fire department and requested that they arrange for necessary assistance.

Since the war, however, most municipal governments have established an Emergency Medical Service as a part of their civilian defense preparations. This service is under the direction of a local chief who is responsible for organizing all of the community's medical resources so that they can be mobilized quickly and employed efficiently for the protection of the community. The Emergency Medical Service thus takes a position at the side of the police department or the fire department in providing service in times of community danger.

Though the Emergency Medical Service was organized primarily to protect the community in the event of enemy action, many communities have had occasion to call upon it for disasters unrelated to enemy action. The persons injured in the Cocoanut Grove fire, Boston, and in the Baltimore & Ohio train wreck near Frederick, Maryland, presented problems similar to those that would be created by enemy action.

The number of major disasters in industry is increasing, owing to the employment of less skilled workmen, hastily constructed factories, unfamiliar processes and numerous other factors. The industrial physician should now prepare plans for the medical assistance he might require in the event of a major disaster in his plant. The Emergency Medical Service, consisting of the mobilized medical resources of the community, is the logical agency for supplying such assistance. The industrial physician should therefore approach the local chief of Emergency Medical Service with his problem, and together they should work out its solution.

Chemical Warfare

LT.-COL. JOHN R. WOOD presented a paper on "Chemical Warfare—A Chemical and Toxicological Review."

Data were given on previously known chemical substances. It was stated that few of these have served as war gases.

Classification of war gases divides them into two groups, (1) the non-persistent, which are effective in less than 10 minutes, and (2) the persistent which are effective for more than 10 minutes.

The toxic properties of the different war gases were also classified: the harassing and casualty types; those which produce lacrimation and/or vomiting; choking and blistering types; and, finally, the blood and nerve poisons. Examples of each of these were given, with the formulae of those not secret.

It should be kept in mind that the so-called screening smokes and the incendiary gases incidentally may cause some difficulty when inhaled.

Excellent kodachrome slides were shown of various types of pathological effects on exposed persons.

Finally, it should be emphasized that gases produce only a small amount of mortality compared with other instruments of warfare.

Convalescent and Rehabilitation Training

BRIGADIER GENERAL DAVID N. W. GRANT closed the first session with a discussion of "The Convalescent and Rehabilitation Training Program in the Army Air Force."

This program was started about a year ago, beginning with physical reconditioning by the use of calisthenics and games, later changed to routine drills. There is a great variety of activity, including Victory gardening and conditioning camps for long convalescent types.

The educational phases include courses in self-protection, an example of which is Judo; map reading; becoming familiar with so-called booby traps, and other varieties of specific activities. Movies are used, models, mathematic courses are given, and there are classes for the illiterate.

In the radio schools, it is of interest to know that instruction is given in bed to those who cannot be ambulatory.

Educational phases also include courses in geo-politics, geography, tropical pests and hazards, and airplane spotting. Phonographs are used for the teaching of languages and dialects. Aquatics and life-saving, supplemented by first aid and courses in gas warfare, are also used.

A very important psychological aspect of rehabilitation is what is known as "outduction"—each man is told why he has been discharged and is instructed with reference to his disability, its nature and as to what he can attempt.

This program has resulted in the reduction of days of hospital stay, and also the time needed for convalescence; it has been instrumental in fitting discharged service men to go back into the service or to go into civilian life.

Excellent slides of various types of activities were used in this presentation. Everywhere is emphasized the importance of proper psychological slants in helping men adjust themselves.

Civilians can well imitate these activities in the postwar period.

First Session, October 12

INDUSTRIAL HYGIENE, "Industrial Health in the Postwar World"—Address of the Chairman, JAMES G. TOWNSEND, M.D.

"Community Emergency Medical Service in War Industry"—WARD L. MOULD, M.D.

"Chemical Warfare: A Chemical and Toxicological Review"—LT. COL. JOHN R. WOOD.

"The Convalescent and Rehabilitation Training Program in the Army Air Force"—BRIGADIER GENERAL DAVID N. W. GRANT.

Second Session, October 13

INDUSTRIAL HYGIENE, Food and Nutrition, and Public Health Nursing Sections—Joint Session: Presiding: JAMES G. TOWNSEND, M.D., IRA A. MANVILLE, M.D., and ELLA E. MCNEIL, R.N.

"Standing Orders for Nurses in Industry: Prepared by the A.M.A. Council on Industrial Health"—CARL M. PETERSON, M.D.

"Practical Experience in Industrial Health Education"—LAWRANCE WEAVER, M.D.

"Nutrition: A Factor Important for Industrial Hygiene"—GEORGE R. COWGILL, PH.D.

"Costs, Space, Personnel and Equipment for Feeding Programs in Small Plants"—WAYNE L. RITTER, M.D.

"The Industrial Nurse in Wartime"—CATHERINE R. DEMPSEY, R.N.

Third Session, October 13

INDUSTRIAL HYGIENE: "Automatically oCntrolled Suction Device for Field Air Sampling"—ALFRED SETTERLIND.

"Current Progress in Sterilization of Air"—STUART MUDD, M.D.

"The Problem of Industrial Noise"—PAUL SABINE, Ph.D.

"Luminous Dial Painting: A Warning and a Practical Control Program"—MANFRED BOWDITCH.

Fourth Session October 4

INDUSTRIAL HYGIENE and Health Officers Sections: Presiding: JAMES G. TOWNSEND, M.D., and MALCOLM R. BOW, M.D.

"State Support of Industrial Hygiene: Its Urgent Necessity"—WARREN F. DRAPER, M.D.

"The Private Physician, the Health Department and the Small Industrial Plant"—STANLEY J. SEEGER, M.D.

"Procurement and Assignment: The Problem of the Industrial Hygiene Engineer"—CLARENCE D. SELBY, M.D.

"Preventive Industrial Dentistry"—C. R. TAYLOR, D.D.S.

"The Industrial Health Program of the Chamber of Commerce of the United States.

Standing Orders for Nurses

DR. CARL M. PETERSON made an announcement with reference to "Standing Orders for Nurses in Industry," prepared by the Council on Industrial Health of the American Medical Association.

For some time the medical and nursing professions have been concerned about the employment of nurses in industry without adequate medical supervision. The Council on Industrial Health has, therefore, been requested to formulate standing orders for industrial nurses which can be adapted to meet the requirements of individual industrial medical departments. If no responsible industrial medical authority exists, it is recommended that the nurse request helpful instruction in this regard from the committee on industrial health of the appropriate county or state medical society.

Industrial Health Education

DR. LAWRENCE WEAVER discussed "Practical Experience in Industrial Health Education." This detailed the experience in an industrial organization having 4500 people, which in 1931 arrived at the concept of keeping people well. This company had experienced high sickness rates, and had discovered that 30 to 40% of the personnel was on an inadequate diet, because of shift work. Another evidence of food deficiency was the discovery that 30% of the women and 43% of the men had experienced night blindness. It was commonly noted that there were poor habits of dress, that there was no adaptation of sleep to shift hours, and that there was great necessity for a cleanliness program.

It was early discovered that employers are interested mainly in production, that employees are interested mainly in wages, and that doctors are interested in therapy and curing disease.

In the beginning of the activities, a central health committee was formed, and local committees were also initiated. Health bulletins were distributed, articles were prepared and printed, and bulletin boards were used with posters, particularly those that had been produced by the Virginia State Department of Health. The foremen were instructed in the preparation of material for counseling, usually used in a period of 15 minutes. Talks by dieticians and matrons were a part of the program, and there was adequate medical supervision in the cafeteria, supplemented by trained dieticians in the preparation and serving of balanced meals.

The experience showed that 50% of the lost time occurred in a group comprising 15% of the plant population, and concentration was placed on this group, obtaining information, with a follow-up program on the supervision of physical defects, supplementing this program by contacting social agencies. Union help was sought and obtained on some of the various problems. In a follow-up on interviews after a period of one year, it was discovered that 300 persons were definitely improved in health status.

As a result of all of these activities, various diseases were reduced in incidence and the amount of time lost because of them, and there was also a definite improvement in morale.

Unfortunately, because of large labor turnover in recent times, the company is right where it started when the program was first begun.

Nutrition

DR. GEORGE R. COWGILL discussed "Nutrition—A Factor Important for Industrial Hygiene."

Nutrition may now be said to be of equal importance with protection of employees against injury and also against disease.

Considerable progress has been made in nutrition, there now being 40 items of significance in the nutrition program as compared with a few at the turn of the century.

It is common experience to find that industrialists ignore many factors which are of importance and emphasize others which are not so important.

Both the British and Canadians have set up regulations. In this country, there are a number of cooperating agencies, including the Nutrition Committee of the Industrial Research Foundation, the American Medical Association, the American Association of Industrial Physicians and Surgeons, various state groups, and the Federal Food Distribution Administration at Washington.

That there is a close relationship between food and productivity really needs no argument.

A study of 4000 families in 1939 showed that a California group had the best dietary habits and provisions; however, an aircraft group in this same area was shown to be greatly defective.

Previous experience has pointed out that we should seek the facts on which to base remedial measures in nutrition problems. Further studies are needed. Two factors are important in industrial feeding: (1) the organization of facilities, with the provision of proper scientific personnel and the adequate preparation and serving of food; (2) the education of employees by the use of appeal methods of all sorts.

With respect to the provision of adequate lunches and the use of lunch boxes, the Bridgeport plan was cited as a good example of community effort.

Mobile lunch facilities have been widely used, and have been rated as the first choice by many representatives of management and labor.

The change-over from the use of carbonated drinks to milk takes some education, but it can be accomplished, as has been noted. There has been a great deal of improvement in the nutrition of confections, and there has been much accomplished by research in this direction.

The subject of vitamins is a much abused one, many people preferring the easy way. A great deal could be said about the specific use of vitamins under adequate medical supervision, for example, the use of ascorbic acid for persons who are exposed to TNT, and the use of vitamin A in those persons subject to glare.

Trained technicians are greatly needed to assist in educational activities with respect to the proper use of food stuffs and the assaying of industrial feeding facilities; moreover, to repeat, there is great need for more extensive scientific nutritional studies in industry.

Feeding Programs

DR. WAYNE L. RITTER presented a paper on "Costs, Space, Personnel and Equipment for Feeding Programs in Small Plants."

One is constantly reminded that education is only an approach and does not constitute the full job in industrial feeding.

Adequate space should be provided for eating facilities in industrial plants, particularly not forgetting that washing facilities are necessary. These cafeterias and restaurants can also be used for meetings, for libraries, for dancing, and for other forms of recreation, thus making use of the investment. Vending machines have a place in the nutritional program, but probably are not available at the present time.

The amount of time allowed for lunch has been a much discussed problem, and it can only be said here that the feeding program must be adapted to this schedule. Supplementary feeding is important, and it has been found cheaper to supply foods in mid-afternoon and mid-morning than to allow the workers to experience slumps in production. Canteen set-ups should be simple at first, and they may be later expanded.

With respect to the number in which a program is effective, it has been found that from 800 to 2000 on a shift is the usual number of workers where programs can be properly managed. And where someone directs the program and is responsible for it, and has the proper educational and technical background as well as being up-to-date, the program pays. However, one should expect a deficit during the first year—after that, the program should be able to carry itself. In conclusion, it must not be forgotten that the proper personnel is now difficult to obtain and hold.

The Industrial Nurse in Wartime

CATHERINE R. DEMPSEY, R.N., completed the second session by discussing "The Industrial Nurse in Wartime."

The industrial nurse has a big job to cope with the many problems she finds in industry. There is a priority on industrial health, and the industrial activities should be coordinated with those of the community.

The usual program of duties of the industrial nurse was outlined, particular emphasis being placed on the handling of handicapped persons and their rehabilitation, and the employment of techniques to save the time of the nurse. It was emphasized that personal teaching is better than the use of printed matter.

There is a big job to be done on health education and on the prevention of non-industrial accidents and sickness, on a proper assessment of social factors, and on the study of poor attitudes. There is, therefore, a big job for the nurse to do in teaching alone, particularly with regard to the many personal problems.

The nurse must be in the front line in health education; she must cooperate with the physician, both industrial and family; and put on a preventive program of teaching which can be carried into the home and the community. It is a golden opportunity to take a leading part in the post-war health educational program.

Field Air Sampling

MR. ALFRED SETTERLIND presented an "Automatically Controlled Suction Device for Field Air Sampling," describing a new type of flowmeter to be connected in front of an absorber when using manually operated suction devices. It consisted of a vertical cylinder in which a piston is allowed to move freely up and down. The piston is fitted with an exchangeable orifice the size of which is selected according to the desired air flow. In practice the suction device is so operated that the piston is slowly rising and falling. Thus while the piston is rising the rated air flow is exceeded by a small amount which is compensated for when the piston is falling the same distance. Repeated calibrations showed that accuracy of air flow may be kept within $\pm$ 0.2%. Instructions were given how to construct such a flow meter from a hypodermic syringe.

The flow meter device can be incorporated in the design of an electrically motor driven suction device for the purpose of automatically controlling the air flow. In this case the flow meter is located on the outlet side of the pump. A special switch connected in the motor circuit is located in the top of the flow meter. When the rising piston opens the switch the motor will slow down, and when the piston drops the switch will close and speed up the motor. Thus an average flow will be maintained within narrow limits. Experiments showed that repeated sampling may be done with an accuracy well within $\pm$ 1%. The suction device should be outfitted with a 7-watt lamp connected across the motor terminals to serve as a pilot light, thus enabling the operator to tell from a distance whether or not the suction device is working properly. The light should flicker rapidly. If steady, the speed is either too fast or too slow, and the motor rheostat needs adjustment.

Sterilization of Air

DR. STUART MUDD presented a paper on "Current Progress in Sterilization of Air."

Infections contracted through the respiratory tract are responsible for the great majority of man-days lost to industry through communicable sickness. Investigations during the past 10 years, notably by W. F. and M. W. Wells, and more recently by many investigators, have shown that the vehicle of these respiratory contagions is the air of confined and occupied places, and that the problem of prevention resolves itself ultimately into that of the feasibility of continuous disinfection of the air of enclosed, occupied spaces, supplemented where practicable, (as in influenza?), by measures of specific individual immunization.

Effective continuous disinfection of air has already been shown to be definitely practicable where conditions are favorable and where the problem is approached with adequate determination and technical facilities and skill. This would apply only to reasonably small areas, not to great rooms like those in airplane factories. The technical means used are (a) ultra-violet irradiation of air, and (b) germicidal vapors continuously added to the air. The rationale and techniques of air disinfection, together with strikingly beneficial results of application in operating rooms, in foundling institutions, children's hospitals and schools, have been summarized in "Aerobiology."[1]

A rational and experimental basis for the ultimate control of the air-borne respiratory contagion has, therefore, been laid, and is being added to by current research; this basis has been recognized by the American Public Health Association[2] and the American Medical Association,[3] and by appropriate agencies of the Federal government. The practical art of air disinfection ("sanitary ventilation," Wells) is, however, in only a very early stage of development. The responsibility for development and application of this art to the stage at which it can notably reduce industrial disability and absenteeism rests largely upon industry itself, both upon those firms whose manufacturing and engineering facilities provide the technical equipment necessary for sanitary ventilation, and upon those industries whose imagination and foresight may contribute to the funds for the requisite research and provide the opportunities for application of the developing art under actual industrial conditions.

Luminous Dial Painting

MR. MANFRED BOWDITCH discussed "Luminous Dial Painting—A Warning and a Practical Control Program."

During the past two and a half years a great deal of information has been gathered with respect to the subject of luminous dial painting, and there have been a considerable number of articles with respect to protective measures. With reference to the safeguarding of workers, the *Journal of Industrial Hygiene & Toxicology* for September, 1943, contains two recent summarizations, and there have been publications on this subject issued by the American Standards Association and the Children's Bureau.

Excellent lantern slides were presented showing the various types of set-ups for luminous dial painting, together with illustrations of protective measures and methods. Precautions have been detailed in a previous report and will not be repeated here.

It was stated that breath tests are really most important in ferreting out affected workers. To illustrate this, protocols of radon breath analyses were summarized, and the effect of removal on these persons was noted in an increasing tolerance.

Industrial Noise

DR. PAUL SABINE discussed "The Problem of Industrial Noise."

Excessive noise is a part of the price modern man has to pay for a mechanized civilization. It has long been recognized that prolonged exposure to excessive noise increases nervous fatigue, lowers human efficiency, and, in extreme cases, may result in occupational deafness. As a result of the acoustical research during the last 20 years, the reduction of noise levels in offices by the sound absorbent treatment of walls and ceilings has become common practice. It is a demonstrable fact that an increase of efficiency and a decrease in errors and absenteeism follow as a result of such treatment.

The necessity of the war emergency for maximum production and the increasing employment of women in industry have combined to make the reduction of noise in manufacturing plants a serious problem for industrial management. This paper will deal with methods now available for factory quieting, the limitations which factory conditions impose, and the results that have been achieved by the use of these methods, particularly with regard to absenteeism and labor turnover.

Even more important for the worker's well-being is the necessity for reasonably quiet conditions for his hours of rest. The crowding of workers, working on eight-hour shifts through a 24-hour day, into multiple unit low cost dwellings creates noise conditions during rest periods which may be even more serious as regards health than the factory din. Sleep to be restful must be deep and unbroken. Little, if any, attention is being paid to this aspect of the housing of war workers in this country. The transmission of sound by light, cheap floor and wall con-

1. Publication No. 17, American Association for the Advancement of Science, Washington, D. C.
2. HOLLANDER, A.: *Am. J. Public Health*, 33:980, August, 1943.
3. Report of Council on Physical Therapy. *J.A.M.A.*, 122:508, 1943.

struction may be as great as 10 times that in better class dwellings. The protection of the sleeping worker from the ordinary noise of his waking neighbors should be as important as are water supply and sanitation. Reasonably sound-proof walls, floor and ceiling construction that will give a fair degree of insulation for impact sounds can be built, but seldom are. Relatively little has been done in building research, and in practical application of existing scientific knowledge towards improving the housing conditions, with regard to noise, of the thousands of men and women who are fighting the battle of production on the home front.

The reduction of needless noise has in recent years attracted the attention of the police and health authorities in some of our large cities. Following the lead of the British in their Noise Abatement League, the National Noise Abatement Council has been formed on a nation-wide scale. Organized for the purpose of "promoting a national consciousness of the need for the control of noise, to publicize the costs of noise and its evil effects on individual health and efficiency," this body has, for the last four years, carried on an increasingly effective educational campaign. The coordination of the work with the larger program of the National Health Association would materially aid in the creation of a quieter, hence a better, "World of Tomorrow."

State Support of Industrial Hygiene

DR. WARREN F. DRAPER discussed "State Support of Industrial Hygiene—Its Urgent Necessity."

Industrial hygiene has been given great emphasis by war production, although only skeleton staffs are available, and the need for further development is evident. It is estimated that 54 million workers are now used in war plants, including young persons, women, and the elderly; with the increase of hours and the use of new materials and operations, it is evident that industrial hygiene is of great importance from a supervisory point of view, as well as from the scientific consideration.

The emphasis on industrial hygiene has come somewhat late—up to 1936 the work of the U. S. Public Health Service was mainly restricted to research and investigations; in 1914 two states had bureaus of industrial hygiene; in 1936 there were 10 states, now there are 38 states having such facilities.

There are many varieties of problems now presenting themselves in the hygiene divisions, which can act as a liaison between labor departments and industrial accident commissions. Most states work only on an educational basis. The laws vary in different states; for example, North Carolina provides that the industrial commission shall make investigations and examinations, whereas in many localities examinations and surveys are made by the health department. This department should be an impartial agency, and should not participate in compensation activities.

Many agencies are interested in industrial hygiene activities, including labor, manufacturers' associations, and chambers of commerce.

Refresher courses present an important phase, where the cooperation of various schools, medical societies, and other agencies is necessary.

Financing has become important—approximately 50% of the present appropriations have been made by Federal grants; in six states the total appropriation was Federal —in seven states and one city the appropriation was 75% Federal—in 12 states 50% was Federal, whereas in four states there was less than 25% Federal appropriation, and four states only were on their own.

The loan of personnel and equipment by the U. S. Public Health Service has been quite general, and has been interpreted for the most part as an emergency action.

Provision should be made by the state administrations for replacement of personnel and for replacement of equipment postwar.

With respect to recent activities, the extension of industrial hygiene work into and involving nursing, dentistry, and health education has been proceeding.

Finally, now is the time for the appraisal of services and the adjustment of facilities to meet possible postwar retrenchment, and also to consider plans for the continuation of the proper services.

The Private Physician

DR. STANLEY J. SEEGER presented a paper on "The Private Physician, the Health Department and the Small Industrial Plant."

The necessity of coordinating activities of those interested in industrial health has reached a critical point in the present war emergency. The changing character of the problems of industrial health has been further emphasized and put in a new light by the war. The shifting of large numbers of the population, the problems of housing and nutrition and the new hazards which are introduced by our tremendous industrial expansion have all contributed to make the situation more complex. The essential medical character of industrial health problems and the necessity of medical guidance in their solution have remained a basic principle, the soundness of which has become more and more apparent. The war has emphasized the fact that the American worker occupies a position which is superior to that of any other worker in the world when compared from the social, economic, medical and educational standpoints.

We are able to say in the face of the present situation that we are better equipped to take up the slack which develops between the creation of new hazards to the industrial population and the application of measures to cope with them. One of the important elements in the program of the Council on Industrial Health has been the development of cooperating agencies in the constituent state medical societies and, where practicable, in county medical societies. During the past year this activity has received vigorous stimulation from field work of the central office, and most encouraging development can be reported, so that, today, the rank and file of physicians are organized and ready to participate in industrial health activities to help safeguard our essential war workers. The state and county committees serve not only as centers for the development of industrial health programs but they also help to define and solve local problems.

They make most important contributions to the education of the public in this field.

The Council has repeatedly placed emphasis on the large number of workers whose entire medical program is provided by the general practicing physician. In smaller industries in most instances the only services in the field of industrial hygiene and health control are those which he may direct. The small plant offers numerous difficult problems when an attempt is made to supply to it a modern industrial health service. The program for small industry advocated by the Council stipulates that every plant should have: (1) a physician; (2) a nurse; (3) industrial hygiene service; (4) proper correlation of plant health activities with those of the practicing medical profession, industrial commissions, and units of state, county and city health departments; (5) a health program to include physical examinations, plant inspections, emergency stations, and reporting; (6) adequate compensation of health personnel.

Industrial Hygiene Problem

DR. CLARENCE D. SELBY made a very brief presentation on the subject "Procurement and Assignment—The Problem of the Industrial Hygiene Engineer."

The use of industrial hygiene engineering methods in the protection of war workers has increased greatly. The supply of trained industrial hygienists was definitely limited when war was declared, and there have been no appreciable new supplies. The industrial hygiene programs of the Federal agencies have been greatly augmented, and the war industries have had, in fact still have, great difficulty in maintaining service. To meet this great need the School of Public Health of the University of Michigan has arranged an industrial hygiene course for plant safety personnel. This was described. (See INDUSTRIAL MEDICINE, October, 1943, pg. 720.)

Preventive Industrial Dentistry

DR. C. R. TAYLOR discussed "Preventive Industrial Dentistry."

Preventive industrial dentistry had its beginnings in the early 1900's, securing increased attention after World War I. But it was not until 1942, when a consultant was added to the U. S. Public Health Service staff, that considerable impetus was given to the movement. More recently a group of industrial dentists has been formed by the American Dental Association for the study and planning of services. The State of Michigan also has a dental consultant.

It is important at the present time to plan additional features, and also to plan permanent programs.

An example of what can be done was detailed with reference to the emergency dental clinic set up at Ypsilanti, Michigan, where a U. S. Public Health Service dental consultant was detailed. War workers are here given first attention, and others as opportunity permits, including extractions, fillings, x-ray films, and treatment of Vincent's angina and gingivitis.

As yet no data have been gathered on the saving of lost time, but this is now being obtained. The important thing about the whole set-up is the ability to cooperate with community dentists and to provide facilities for workers on an emergency basis.

The Pomona plan was referred to, where dentists set aside one day a week for workers, and also use evening hours for day workers.

Industrial physicians can participate to good advantage in this program, along with the employer, the employee, and dentists.

Examples of clinical dental problems were described and commented upon and, finally, a pre-payment plan for children with respect to controlling dental problems in the younger group was mentioned as a possibility.

C.C.A. Program

MR. HOWARD STRONG closed the sessions, speaking on "The Industrial Health Program of the Chamber of Commerce of the United States of America."

The general public health aspects of this program were outlined, being described by several publications of the Chamber which were distributed at this session.

It is the purpose of the Chamber of Commerce of the U.S.A. to stimulate local programs, secure local cooperation, not with respect to technical problems, but rather to help to spread and apply general information.

Use is made of an advisory council chosen from different communities, as previously announced. Cooperative relationships are carried out with official agencies, such as the American Medical Association, the American Public Health Association, the U. S. Public Health Service, and others.

It is believed that the Chamber of Commerce has a major job to do in educating the public, to help the public become more health-conscious, and to provide information for public release to the press, radio, printed bulletins, and other forms.

The second phase of this program is action as a result of information released. Health committees have been formed in city chambers of commerce and examples of the public health activities of these were summarized.

Booklets and bulletins have been prepared for distribution on various health problems.

It is proposed that an annual appraisal of community health programs be made by state health departments, with the advice of the U. S. Public Health Service.

Chlorinated Compounds

—Precautions in Handling—

DR. A. G. CRANCH, Director of Union Carbide & Carbon Company's Toxicological Laboratory, submits the following precautions for handling certain chloro-naphthalene, chloro-diphenyl, and related chlorinated compounds. These were developed, under his direction, by the Halowax Products Division, (30 East 42nd St., New York), and are presented here not only for their value in avoiding harmful effects from these chlorinated materials but also on account of the applicability of these precautions to operations where analogous materials are employed. The practice of the manufacturer in distributing this information to all of its customers, and to health agencies generally, is to be commended.

PRECAUTIONS for Handling Chloro-Naphthalene, Chloro-Diphenyl, and Related Chlorinated Compounds:

These compounds constitute a group of synthetic waxes made by the chlorination of a coal tar derivative. The compounds most commonly handled in industry are those containing chlorinated naphthalenes, chlorinated diphenyls, and chlorinated diphenyl oxide. These materials have certain characteristic toxic properties. Their toxic action is evidenced commonly in the development of a form of acne, which usually does not appear until after some weeks or months of continuous exposure to these materials. This exposure may be either to fumes from the hot material or from continued contact with the solid material. It can only follow repeated or continuous contact, and will not develop because of short and infrequent exposures. It closely resembles common acne, but differs in that it is usually encountered on the face — including forehead and temples — neck, chest, anterior surfaces of the thighs, outer surfaces of the arms, and sometimes around the waistline, rather than simply on the face and back, which are the more usual locations for common acne. Usually the acne from this industrial exposure is accompanied by a larger proportion of comedones (blackheads) than is the case with common acne; also, itching may be a prominent symptom.

In exceptional cases liver damage may occur through inhalation of the fumes. This is a rare form of poisoning, in contrast to the appearance of acne, and seems to have no relation to the extent or duration of the acne, which may have occurred, but is dependent on other factors. It does not result from casual exposure, but is a cumulative effect.

Experience has shown that, despite their toxic properties, these chlorinated materials may be safely used if proper control measures are observed. Under good operating conditions the appearance of acne should be reduced to a minimum, and easily brought under control. With these precautions, cases showing liver damage probably would never occur.

Preventive Measures

MECHANICAL: Wherever these materials are handled, good housekeeping conditions must be maintained. There should be no careless scattering of material. All equipment and work places should be thoroughly cleaned, preferably every day. Those engaged in this work should take the same personal precautions as are outlined for operators. Equipment should be of an enclosed type, and fumes and vapors removed by exhaust ventilation. This is especially important where the materials are handled in a hot condition. Where the so-called cold process is used, in which the chlorinated waxes are dissolved in a solvent, full precautions should be taken to control the vapor given off by the solvent itself at room temperature, and by the compound as well when the solvents are driven off later by heating.

Our engineering department is ready at any time to advise regarding proper design for ventilating equipment for proposed or installed processes. The efficiency of ex-

isting installations can be checked by special equipment, which we will make available when required.

HYGIENIC: Care must be used in the selection of workers. Young people are more prone to develop acne. It would not be desirable to employ such individuals on this work unless their skin is clear, dry, and free from excessive waxy secretion. Those showing an oily skin with a tendency to the formation of blackheads or acne should not be employed. Those having a history of skin disease, liver disorders, or alcoholism should not be employed. Those recently exposed to chlorinated volatile solvents, or those under treatment requiring the use of the heavy metals, as in syphilis, should not be employed. After employment, there should be close supervision of the workers to detect any evidence of acne in its earliest stages, or any evidence of digestive disorders, jaundice, or other symptoms suggesting liver involvement. *Employees showing such symptoms should apply at once for treatment by a qualified physician who is aware of the possibilities present in their industrial exposure.*

PERSONAL HYGIENE: (a) All unnecessary prolonged contact with these materials should be avoided. This as to vapors from the heated material, and exposure to the solid.

(b) There should be a complete change from street clothes to working clothes before going to work. Work clothes should be supplied including such items as starched and laundered cover-alls of light color and close weave; socks; caps; and underwear (preferably union suits with long sleeves and legs). Gloves and aprons should also be supplied where indicated. Sleeves should be buttoned at the wrist. Cover-alls should be buttoned at the neck. Fresh work clothing should be supplied for regular operators twice a week or oftener, daily in hot weather. It should not be taken home for laundering. Provision should be made by the employer for this. If exposure is occasional or intermittent, a different schedule might be warranted.

(c) Separate lockers should be provided for street clothes and work clothes, which should never be kept in close contact in the same locker.

(d) It is essential that face and hands be washed before eating, and that a shower be taken on quitting work. It is recommended that the daily shower should be supervised to make certain that washing is thoroughly carried out before resuming street clothes and leaving the work place.

(e) A suitable skin cleanser should be provided. Strong solvents or soaps containing mineral abrasives should be avoided. Powdered soap containing a corn meal abrasive is probably the most suitable soap, but there are a number of recently developed cleansers based on sulfonated vegetable oil, which may prove to be very satisfactory.

(f) Protective creams offer an additional protection when applied to the face and hands, or to other exposed skin surfaces. These should be applied before work and renewed at least once or oftener, if necessary, through the day. Contact of soiled hands with the face should be avoided. Soiled waste or rags should not be used on the face.

(g) Employees should be cautioned as to the effects of excessive use of alcohol, exposure to chlorinated hydrocarbon solvents, or continued exposure while under medication involving the use of the heavy metals, such as arsenic or bismuth. They should also report at once any evidence of dermatitis, or digestive or liver disturbance.

Light, Temperature, Humidity

—Effects in the Working Environment—

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THE EFFECTS of Temperature, Humidity, Air Movement and Radiant Heat.

A. Acute Effects of High and Low Temperatures:

These topics will be discussed from the viewpoint of the acute effects on health in general, on ability to work and their relation to accidents, together with suggested methods of obtaining optimum conditions and of preventing their harmful effects. These physical factors are of importance to industrial workers because they control the amount of heat which can be lost by the body. If sufficient heat cannot be lost, the pulse rate, blood volume, body temperature, respiration and, at high temperatures, the metabolism increase. Because of the cutaneous dilatation, the diastolic blood pressure may fall, if not well compensated. When excessive sweating occurs, salt and water may be lost from the body in sufficient amounts to cause a fall in the concentration of sodium chloride and dehydration of the blood. All of these factors place a marked strain on the circulatory system, the heat regulating mechanism and other structures of the body, which, if extreme, may lead to heat cramps, stroke or exhaustion. Heat cramps are characterized by spasmodic cramps of the skeletal muscles. They may be cured by sodium chloride given either by mouth or intravenously. They are due to the loss of sodium chloride and water from the body through the sweat, and may be prevented by taking salt and water by mouth at intervals during the work shift. Heat exhaustion presents the symptoms of shock to a greater or less degree. It is presumably due to a failure of the cardiovascular system to compensate for the adjustments necessary in exposures to high temperatures. It is reported that the incidence of heat exhaustion in industrial workers has been greatly reduced since salt or salt and sugar tablets have been provided. Heat stroke (or sun-stroke) is characterized by a very high body temperature, often associated with delirium and convulsions. The reason why the heat-regulating mechanism fails in these cases is not understood. It should be noted that many industrial cases show symptoms common to more than one type of heat disease. This is especially true of heat cramp and exhaustion.

The chief effects of exposure to low environmental temperatures among industrial workers are local changes in the skin and subcutaneous tissue of the extremities leading to acute transient inflammatory reactions, frost-bite, chilblains, etc., which may, if extensive, lead to necrosis and gangrene of the tissues.

B. Effects of Temperature and Humidity on Resistance to Disease:

Exposure to high temperatures followed by chilling predisposes industrial workers to acute respiratory diseases such as pneumonia, but does not appear to affect the incidence of tuberculosis. Chronic rheumatism appears to be higher in some industries where sudden changes in temperature and excessive moisture are present. Exposure to high temperatures may also increase the rate of absorption of harmful chemical substances. There is at present no very sound evidence that either high or low humidity *per se* affects the resistance to disease.

C. Relation of Temperature to Work and Accidents:

The acute effects of high temperature are greatly increased when a man is doing heavy physical work, since exercise itself causes an increase in heat production, pulse rate, respiration and body temperature. At the same time, workmen are unable to do as much physical work at high temperatures. Even a slight rise in air temperature decreases the capacity for physical work, and at very high temperatures the ability to work is greatly curtailed. Low air temperatures sufficient to cause numbness also reduce the ability to work. It is reported that the accident rate

The text of DR. BAETJER'S Lecture at Long Island College of Medicine's Post-Graduate Course in Industrial Medicine, November 4, 1943.

in industry is greater at both high and low temperatures than under optimum conditions.

D. Optimum Conditions of Temperature, Humidity and Air Movement:

Optimum conditions of temperature, etc., vary with the amount of physical work required and many other factors. For light sedentary work the optimum for winter is between 68°-73° F, and for summer 75°-80° F; for moderately hard work 65° F, and for strenuous work about 60° F. If the workmen are exposed to large sources of radiant heat such as furnaces, hot metal, the sun, etc., the body may gain much more heat than it can lose by radiation to the surrounding objects, and under these conditions the air temperature should be lower. Conversely, exposure to very cold walls or other surfaces at low temperatures may necessitate higher air temperatures. The humidity is of little importance at temperature between 65°-75° F, but is of great importance when the air temperature is high because then the chief method of heat loss is by evaporation of sweat and this depends largely on the humidity of the air. At low temperatures a low humidity is also desirable. At normal temperatures the air movement should not be over 40 or 50 feet per minute. At higher temperatures or with heavy work it should be greater since it facilitates heat loss from the body by rapidly replacing the warmer moist air in contact with the body surface with cooler, dryer air, but it should never be over 150 or 200 feet per minute. Air movement is of no value if the air is saturated and the temperature is above 98° F.

The endurable limits of air temperature (Yaglou: *Indust. Hyg. & Tox.*, 19:12, 1937) are shown below:

TABLE 1.
ENDURABLE LIMITS OF TEMPERATURE
(Air movement under 25 feet per minute)

Relative humidity in per cent	Dry Bulb Temperature ° F.	
	Rest or light sedentary work	Heavy work (depends on severity of work)
100%	90°	80°
60	100	88
50	105	90
30	110	96
20	118	100

E. Preventive Measures:

Personal measures for preventing the harmful effects of high temperatures consist in taking salt with the drinking water, shorter hours of work when the temperature is high, cessation of work at early symptoms of heat exhaustion, measures for prevention or rapid chilling such as the avoidance of chilling drafts and replacement of wet clothes with dry ones before going out into the colder air, and the proper types of clothing. Exposure to hot environments may be prevented, where possible, by general or local ventilation, air-conditioning, air movement, and measures for preventing the absorption of excessive radiant heat.

EFFECTS of Radiant Energy Ultra-violet, Visible and Infra-Red Radiation:

A. Effects of Ultra-Violet and Infra-Red Radiation.

Exposure of industrial workers to excessive ultra-violet, infra-red and very intense visible radiation, such as from welding arcs, etc., may cause temporary or possible permanent damage to the eyes. Since the ultra-violet radiation is absorbed chiefly by the conjunctiva and cornea, conjunctivitis is the characteristic reaction. If the exposure is sufficiently severe the cornea may also be involved with ulceration in extreme cases. Infra-red radiation reaches the retina and may produce scotoma of the retina as well as other heat effects in the eye. Infra-red and ultra-violet radiation are probably factors in the production of cataract under certain conditions. When absorbed by the skin, ultra-violet radiation causes inflammatory reactions (sunburn) and, if very intense, ulceration of the skin. It is believed that prolonged exposure to intense ultra-violet radiation may eventually lead to skin cancer. The heating effects of excessive infra-red radiation have been discussed in the previous section. Protection against harmful radiation consists in goggles, which filter out the harmful rays, helmets and protective clothing. Standards for protective goggles have been set by the U. S. Bureau of Standards.

B. Radiation in the Visible Range—Illumination:

Radiant energy in the visible range (illumination) is an important factor in industry. Too low illumination causes a lowering of visual acuity and speed of vision, and eye fatigue, thus leading to a loss in efficiency and accuracy, and possibly causing a factor in accidents where vision is involved. Glaring lights and reflected glare interfere with vision, and are distracting and annoying to the workers. Very low illumination may also have a depressing effect psychologically. Proper illumination consists in sufficient light without glare and shadows, and without great contrasts between the field of vision and the surroundings. In general it can be said that for work equivalent to ordinary reading of black print on white background the illumination should be about 15 foot-candles. Higher illumination intensities are required for more detailed eye work or when the color contrast between the object and the background is not as good as in ordinary printing. Somewhat lower illumination may be used when close eye work is not involved. Recommended levels of illumination have been published by the Illuminating Engineering Society.

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Hydrogen Fluoride Exposure

—Prevention, in the Operation of HF Alkylation Plants—

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THE demand of our flying forces for a superior fuel having exceptional power for short-run takeoffs and for long-range bombing has proved a stimulus to the use of new tools—called catalysts—by the refining industry.

These new tools present new problems to the safety engineer.

Anhydrous hydrogen fluoride (HF), a catalyst widely employed in the production of alkylate, is a major component of 100-octane aviation fuel. It is a colorless liquid which boils at 66.7° F. When exposed to the atmosphere, it fumes or vaporizes strongly; and, because of its high affinity for water, it readily combines with the moisture of the air. The acid vapor thus formed looks very much like steam. Its presence in the atmosphere can be readily detected by its strong, pungent odor and irritant property.

Like high-temperature oil or vapor, HF is harmless when kept within the confines of the processing equipment. Oil or vapor at high temperature causes a thermal burn on anyone exposed to it, while HF produces a chemical burn. New measures, therefore, must be adopted and rigidly enforced to protect the personnel of plants employing HF. Methods of first aid and of medical treatment must be learned in order to care for injuries incurred through the failure to observe or to enforce the rules and regulations that govern the safe use and handling of this acid. Reliance must be placed upon the designer to provide the best available equipment for the HF alkylation plant and to incorporate features which will minimize accidental discharge of acid to the atmosphere. The operating management must be thoroughly impressed with the toxic and corrosive nature of hydrogen fluoride to the extent that the safety engineer will be given a free hand in providing the necessary protective equipment, first-aid supplies, instructional data, and authority to demand and enforce adherence to all rules and regulations for safety. Plant supervisors must be 100% cooperative with the safety department and, in fact, should bear the responsibility for the safe operation of the plant. The insidiousness of HF permits of no relaxation of intelligent supervision. Safe performance on the part of the operators, maintenance men, and others employed on the HF plant is essential; it will be obtained if they are adequately informed regarding the nature of HF and the proper manner of handling it.

There should then be no need for cajoling or coercing to obtain compliance with rules and regulations for safety.

The subject of safety in the alkylation plant may be considered from the following angles:

1. Meaures incorporated in the plant design.
2. Protective devices auxiliary to the design.
3. Protective wearing apparel.
4. First-aid treatment of HF injuries.
5. Medical treatment of HF injuries.
6. Physical examinations of HF plant workers.
7. Some general precautions.

Many problems confronted the engineers in designing an HF alkylation plant. But regardless of assurances that the acid will stay in the processing equipment, the safety man must be wary, for the human element factor cannot be overlooked. The designers, likewise, have adopted this attitude. Provisions, therefore, have been incorporated in the design to minimize the hazard of any accidental release of acid into the atmosphere.

An exhauster system is provided with connections to all parts of the acid section of the plant where predictions might indicate the presence of acid on opening or disconnecting for adjustments, repairs, replacements, or sampling. This system also permits the removal of HF vapors from vessels and piping during shut-down for cleansing and inspection. HF is particularly adaptable to removal by evacuation, because of its relatively low boiling point.

The exhauster system discharges to a caustic wash tower for neutralization of HF vapors before release to the atmosphere. The exhaust release is located away from the plant area, so that in case of failure of the caustic system the hazard to persons in the plant area will be minimized.

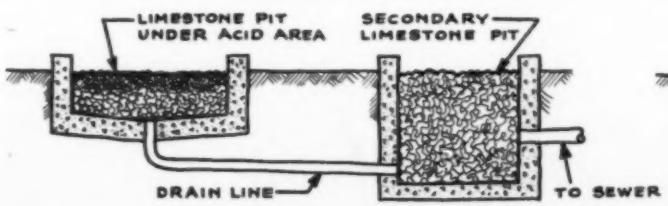
Quick neutralization and disposal are necessary when there are accidental spills of acid in the plant area caused by failure to evacuate properly, by failure of the seals on pumps, contactors, or valves, by rupture of lines or vessels, or by any other untoward incident. For this purpose, the acid-carrying equipment is located in a pit containing a two-foot depth of limestone, with the pit wall extending about 18 inches above the base level to serve as a retaining wall. This wall or curb serves also as a boundary for the restricted acid area. The limestone neutralizes the acid which it contacts so that its spread to the surrounding area is avoided; and contamination by seepage of water through the soil is prevented, as well as corrosion of underground piping and foundation work.

Limestone that has reacted with the acid is removed, and new limestone is laid down after the area is thoroughly washed with water. The spent limestone is deposited in an isolated location away from any processing equipment, where it is allowed to hydrolyze slowly.

An auxiliary limestone pit is provided outside the acid area into which water and/or acid following major spills may drain from the acid area pit for further treatment.

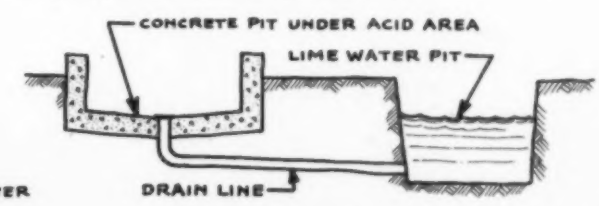
An acid area pit which does not contain limestone may also be used. In this case water washing is done immediately following the spills; and dilute acid solution is then neutralized in an auxiliary pit containing limewater, and the acid is precipitated out. The precipitate is subsequently removed and buried, the liquid being discharged through the sewer after it becomes neutral. (See Fig. 1.)

Disposal of spent acid should receive continued attention so as to avoid contamination of drinking water and pollution of rivers and streams.



Limestone Neutralization System

Fig. 1.



Lime Water Neutralization System

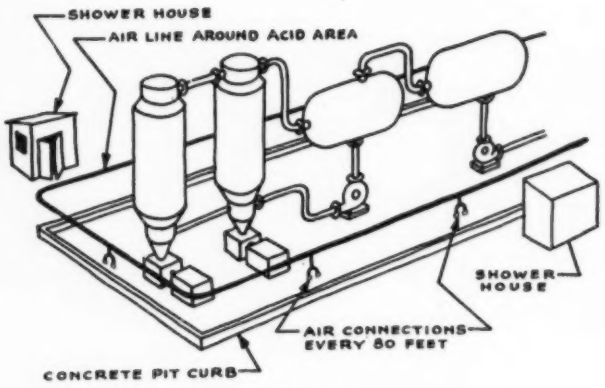


Fig. 2.
Sketch of HF Alkylation Contactor Section Showing Shower House and Emergency Air Lines

The possibility of accidental discharge of acid presents a hazard to the personnel. For the prevention of injury to those exposed to acid contact by accidental discharges, emergency shower and first-aid booths must be provided in order that immediate first-aid measures can be taken. The showers should be operated by treadles so that both hands may be free for removal of clothing. Warm water should be available in winter weather to avoid sudden shock, which may aggravate a similar condition caused by the acid burn itself. The booths should contain bubbler fountains for effective flushing in the treatment of eye injuries. They should also be equipped with the necessary first-aid medicaments and other supplies which will be discussed later.

In order that exposure may be minimized when work must be performed at or near leaks of acid, portable air movers are helpful to create a windward side when the atmosphere would otherwise be still. Obviously workmen should always station themselves on the windward side to avoid blow of acid toward themselves.

Compressed air may be used in lieu of portable air movers, provided sufficient capacity and properly designed nozzles are available.

For rescue work or other duties in an atmosphere that is heavily laden with HF vapors, a complete coverage, air-supplied suit is necessary. For the air supply the acid area should be encircled with an air line with quick attachment hose connections spaced at close intervals. (See Fig. 2.) A complete description of this suit, which has been specially designed for use in connection with emergency operations on the HF plant, will be given later.

Burns resulting from the handling of tools that have been used where acid may have contacted them are avoided by placing receptacles containing sodium bicarbonate at locations convenient for neutralization and removal of any acid film. All tools must be doused in the solution promptly after use and before they are returned to the toolroom. This precaution is a protection primarily to those who may use or handle tools after they have been taken from the acid area where workmen would normally wear acid-proof gloves.

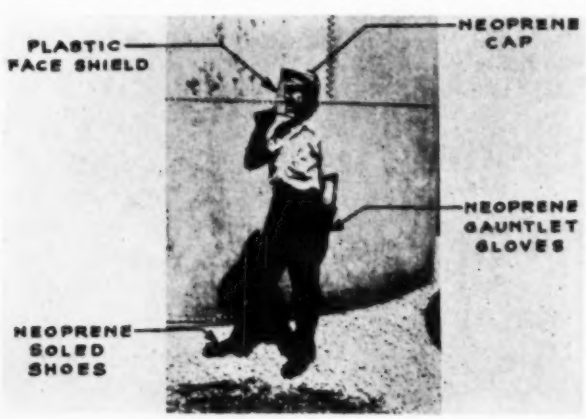


Fig. 3.
Class "A" Clothing

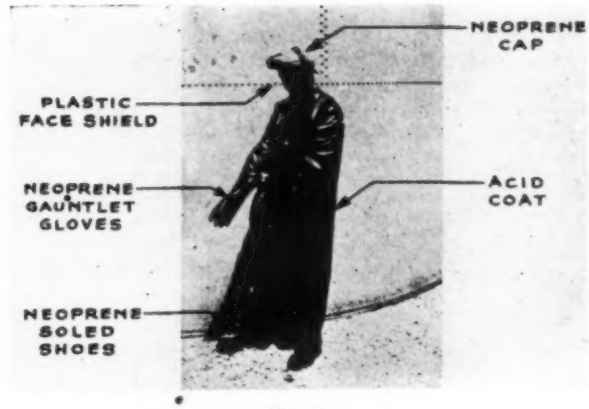


Fig. 4.
Class "B" Clothing

The pit wall mentioned previously constitutes the boundary around what may be termed a restricted area. This wall should be painted a distinctive color, preferably red, and plainly marked at fairly close intervals with signs reading "Restricted Area—Do Not Enter Without Permission." Delegated persons should be granted the authority of giving this permission. The requirement of permission, of course, need not apply to operators regularly assigned to the HF alkylation plant, but it should apply to all others, including maintenance and repair workers. Those granting permission should learn the purpose of each request and then stipulate the type of protective apparel which must be worn. Supervisors and operators should watch the workers in the area, and report any infractions of rules pertaining to the wearing of protective apparel and the performance of duty.

Various types of jobs in the acid area requiring specific protective wearing apparel may be classified as follows:

A. Routine operations.
B. Plant alterations.
C. Maintenance.
D. Emergency or hazardous work.

Protective apparel recommended for the various classes of work is as follows:

Class A

CLASS A clothing, which consists of neoprene-soled work shoes, a rubber cap, a wide-angle face shield, and neoprene gauntlet gloves, is worn only when making a visual observation of the plant under normal conditions. (See Fig. 3.) Any person entering the acid area must wear this equipment; his gloves must be on and his face shield down when he crosses the restricted-area boundary line. The shoes protect his feet against acid that may have condensed on the ground or on the stairways, platforms, and runways. The cap offers protection against acid dropping from above. The gloves are extremely essential, because any surface touched may have an acid film; or in performance of various duties there may be slight discharges of acid vapor, which may come into contact with the unprotected hands by way of tools and other objects that may be handled. The wide-angle feature of the face shield is a protection also to the ears.

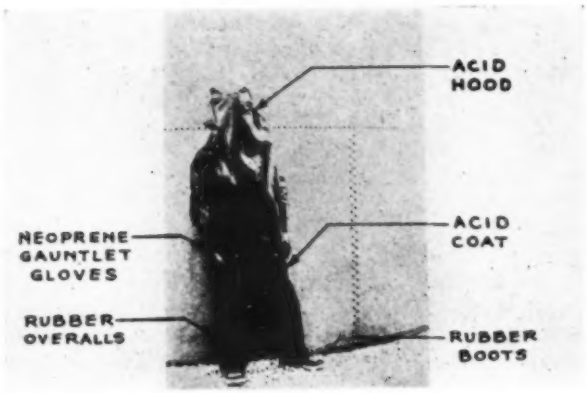


Fig. 5.
Class "C" Clothing

Class B

WHEN changes are to be made in plant operation, Class B clothing should be worn. This clothing includes a rubber or neoprene acid-proof coat, together with the Class A apparel mentioned above; i.e., neoprene-soled work shoes, rubber cap, face shield, and neoprene gauntlet gloves. The purpose of the coat is to provide protection for the arms and body of the workman. (See Fig. 4.) The possibility of pump and packing failures, for instance, when making adjustments to operating conditions prompts this recommendation for additional protection.

Class C

CLOTHING of this classification is recommended whenever acid equipment is to be opened up for inspection or repair. Rubber boots and neoprene acid-proof garments, which include a coat, overalls, gauntlet gloves, and a hood, are worn. Rubber apparel may be substituted if neoprene is not available. Class C clothing protects the wearer against the discharge of acid or acid vapor which may not have been previously drained or evacuated from the inside surface of the equipment. (See Fig. 5.)

Class D

THIS class of protective apparel has been specifically designed for work in acid vapor atmospheres where complete protection might be needed, as in the case of repairing an extremely large leak, or of working where the concentration is higher than that which could be handled by a cannister mask. The clothing consists of a neoprene coverall suit provided with the novel feature of admitting a compressed fresh-air supply to the body as well as the headpiece. (See Figs. 6 and 7.) Through the admission of air to the body portion, the wearer is enabled to move about in comfort; in addition, the air prevents acid vapor from entering the suit because of the air passing out. The constant rush of air blowing out around the neck and other openings makes it possible for the wearer to work safely in any concentration of acid vapor-air mixtures. This feature also is a safeguard in case the suit is torn; the vapors in this instance as well could not enter.

The air supply for this suit is taken off the air line referred to previously as having been installed for that purpose. Operators and others should be required to practice donning the suit so that there will be no loss of time when an occasion arises when the suit should be used. The alkylation plant should be provided with a large and a small suit, and both suits should be readily available at all times and regularly examined for condition.

Safety apparel should be thoroughly washed with water before it is laid away. A suit can be conveniently washed before the wearer takes it off.

Although plant design, protective equipment, and supervision are excellent, accidents may occur; consequently the treatment of casualties has been carefully studied, and facilities for rendering such treatment have been provided.

Prompt action is of the greatest importance for successful treatment. For example, when acid has come into contact with the skin, the area affected should be immediately flushed with water for at least ten minutes. The burning sensation of extremely low concentrations may not become apparent for some time after contact, particularly if the acid has touched the tough thick skin of the hands or feet; therefore, the area should be washed even though there is only a suspicion of an acid contact. High concentrations of acid penetrate the skin rapidly and produce a stinging sensation almost immediately. The warning is sufficient to cause the worker to lose no time in starting first-aid treatment. A delayed-action burn may cause a painful, deep-seated injury that requires medical aid; therefore, splashes of all kinds should be treated for acid burns.

The following first-aid treatment is recommended:

1. Flush well with water for at least 10 minutes.

2. Apply, with cotton, a 10% solution of ammonia (10% of 28% aqueous ammonia solution), and rinse with water. Do not use household ammonia unless none other is available. It is preferable to use a sterile solution made by a pharmacist in accordance with the U.S.P.

3. Rub well into the affected area the special magnesium oxide-glycerin HF burn salve which should be on hand in the first-aid and emergency booths. Blisters, if any, should be opened with a sterile instrument by a competent person.

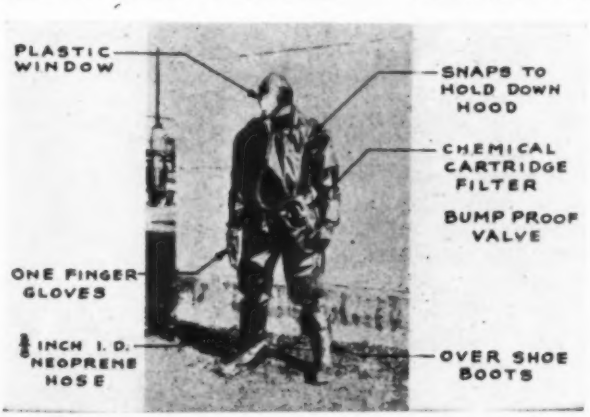


Fig. 6.
Class "D" Clothing—Front View

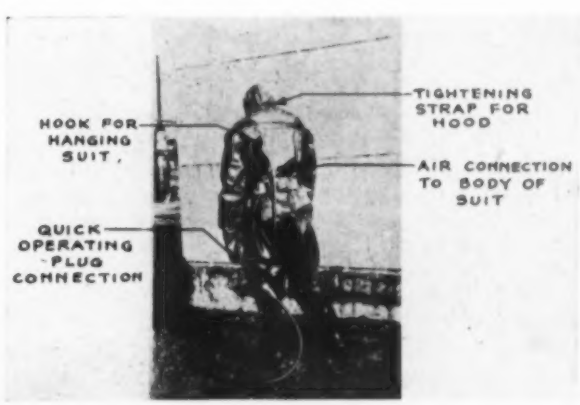


Fig. 7.
Class "D" Clothing—Rear View

With most acids, merely washing with plenty of water and neutralizing, if done quickly enough, are sufficient to stop their action. HF, however, has a double action on the skin: first, there is the acid, which must be neutralized; second, there is the fluorine ion, which must be precipitated. Therefore, it is necessary not only to wash the area thoroughly and apply ammonia, but also to use magnesium or calcium in a form such that it will precipitate the fluorine ion. If there is delay in treatment, or neglect, HF penetrates deeply into the tissues and causes deep-seated burns, which have been compared by one authority to those produced by high-voltage electricity. Blisters are opened so that the salve will reach the acid underneath and stop its action quicker. If the acid has penetrated into the tissue, the magnesium oxide paste applications will not be sufficient to prevent a bad burn, and it will be necessary to obtain medical aid for the injection of 10% calcium gluconate or 20% magnesium sulfate by hypodermic around and under the affected area. This application will form a calcium or magnesium barrier around the burn and prevent further destruction.

Some of the most painful burns experienced have been under the fingernails. Some physiologists believe that the acid penetrates the nail itself, and when under the nail, starts its destruction of tissue in a particularly tender spot. If the calcium gluconate or magnesium sulfate can be injected through the nail or around it, the pain may be alleviated.

The above treatment is not the only one advocated by manufacturers of hydrogen fluoride. A number of authorities favor prolonged washing with water to draw the acid from the tissue by osmotic action. One worker with HF recommends prolonged washing followed by ice-cold alcohol immersion. Even the most painful burn can be rendered almost painless by holding the affected part in ice-water; but when it is withdrawn from the ice-water, the pain may commence again.

It is almost impossible for anyone consciously to inhale enough hydrogen fluoride to harm himself seriously; the acid gas is too pungent for voluntary inhalation. A study of the available literature on this subject showed only one case of a fatality from HF inhalation. The possibility of being rendered unconscious and becoming injured appears to exist only if a man is trapped where gases are suddenly released. Should this occur, the following procedure is recommended:

1. Remove the patient to fresh air, free from drafts.
2. Treat skin burns by the prescribed treatment.
3. Make patient rest.
4. Reassure the patient and discourage him from coughing. Cough syrup should be provided in each shower house.
5. Apply artificial respiration if necessary.
6. Keep the patient warm, because he will be suffering from shock.
7. Call the doctor on all inhalation cases.

Eye injuries among workers handling HF have been rare; strict adherence to eye protection is apparently the reason. Nevertheless, bubbler fountains should be installed in each shower house for flushing and washing the eyes in case of injury. Bottles containing a saline solution should also be available for neutralization. Beyond the administering of water and saline solution medical aid should be sought.

In view of the heretofore limited use of hydrogen fluoride and consequent lack of knowledge or widespread information regarding the treatment of HF casualties, a booklet on the subject was prepared by Dr. Anton J. Carlson, noted physiologist of the University of Chicago, for distribution to medical men located in the vicinities of the HF alkylation plants. Copies of this booklet, *"Treatment of Hydrofluoric Acid Casualties,"* may be secured from the Universal Oil Products Company. Managements of plants have been requested to place the booklet in the hands of their industrial doctors and nurses.

Whenever the subject of fluorine or fluorine compounds is mentioned, the work of Roholm on cryolite workers in Denmark comes to the fore. Roholm found that these men who inhaled fluorine-bearing dusts over a period of many years incurred what he called "fluorosis." After years of work the men became slightly stooped, and their backs stiffened. X-ray examinations disclosed that their backbones and pelvic bones had increased in size, and posthumous examinations showed a surplus of fluorine.

When hydrogen fluoride was proposed as a catalyst, the records of workers in plants where this material was made were investigated for evidence of fluorosis. One of the plants had been taking x-rays of its men every year, but had found no cases of fluorosis. Another plant which had been making HF for over 10 years had all of its men x-rayed, but none had any evidence of fluorosis. One HF manufacturer had been giving his men physical check-ups for more than five years but had never been able to detect any sign of the disease.

The men working in alkylation plants have even less chance of contacting fluorine than those in the acid-manufacturing plants, as the alkylation equipment is all outside while the hydrofluoric acid retorts are all inside. However, our men are always examined before they are assigned to HF alkylation plant operation. If there are any abnormal bone or joint conditions, the men are eliminated from further consideration. X-ray examinations will be repeated annually for confirmation of our present belief that a worker in normally good health, when assigned to HF alkylation plant operation, need have nothing to fear regarding any ill effects as a result of this employment.

In addition to the x-ray tests we advise pre-employment analysis of the urine for fluorine content. From work done by Machle and Largent, of Kettering Institute in Cincinnati, it has been established that the fluorine content of the urine is an indication of the fluorine intake of the individual. If the normal content is known, then a check analysis every six months will show any amount absorbed. Arrangements have been made with Kettering Institute to analyze the samples. We believe that these tests will prove to HF alkylation plant personnel that there is no fluorine intake as a consequence of their employment.

For the purpose of detecting leaks which may cause contamination of cooling water with HF, a pH recorder is employed on the water outlet from the plant. The leakage of acid into the water system, or vice versa, would present a serious problem of corrosion. Contamination of water in streams or rivers into which waste water from the plant is discharged might cause complaints on the part of public health agencies and fish and game authorities. Only through carelessness and lack of attention, however, would this eventuality arise.

Spent bauxite from the bauxite treaters, contaminated limestone from the neutralizing pit, precipitated calcium fluoride, or waste materials which cannot be easily and completely decontaminated must be disposed of in a safe manner and in a place where they will not constitute either a hazard or a nuisance. These materials should be dumped into a pit over the bottom of which has been placed a layer of lime. Lime

should also be spread on top of the dumped material so that any free fluorine remaining in it will be converted to stable calcium fluoride. Flammable materials which may contain HF should be burned.

Identification of all piping in which there is or may be hydrogen fluoride should be in accordance with the color scheme of the A.S.A. Code. This Code stipulates yellow as the color for hazardous materials. Lines containing other materials are to be painted in accordance with the respective colors specified.

Acid spills on floors, stairways, and platforms should be immediately neutralized with soda ash. Small pans containing this chemical should be provided to catch drippings.

All equipment which has been in acid service should be thoroughly neutralized before it is turned over to shop or warehouse, or placed elsewhere for subsequent disposal where it may be handled with the bare hands. A strong soda ash solution is recommended as a neutralizer. Shop repair and maintenance men, warehouse men, and others should be warned of the danger of HF so that they will be on the alert for any indication of acid.

Traffic through the acid area should be confined to the men whose duties require it. All others should walk around the area.

Whenever possible, workmen should station themselves on the windward side when making valve adjustments, taking up packing on pumps, lubricating cocks, or tightening flanges. In case of serious leaks requiring exit from the immediate area, workmen should retreat in the windward direction.

There should be no relaxation in compliance with rules and regulations pertaining to the use and handling of hydrogen fluoride. Strict supervision must be in force at all times.

American Industrial Hygiene Association
News of Local Sections

Metropolitan New York Section

THE subject "Mechanism and Procedure of Setting up Industrial Standards for Toxic Substances" was discussed by MR. FRANK LOW, Technical Department, Westvaco Chlorine Products Corp., New York, member of the American Standards Association Committee for developing such standards, at the meeting held October 20, 1943. MR. LOW pointed out that a true standard must be the consensus of experience, knowledge and information concerning what is indispensible for the protection of human life—in so far as application to prevention of injury is concerned. There are several standards-making bodies; (1) governmental agencies; (2) industrial trade associations; (3) plant methods; (4) the National Safety Council; (5) the National Fire Protection Association; (6) the American Standards Association. The general purpose and intention of the American Standards Association was detailed, and its operation through committees representing a cross-section of the interests involved was described. The history of the carbon tetrachloride code was used as an illustration of the procedure leading to the establishment of uniformity in standards throughout the country. Mr. Low noted the several advantages of adhering to standards adopted by the American Standards Association.

At the meeting on November 17, 1943, this section heard MAJOR E. W. PROBST, M.C., Surgeon, Station Hospital, Office of the Surgeon, Picatinny Arsenal, Dover, New Jersey, discuss "Industrial Hygiene Problems at an Army-Operated Arsenal." MAJOR PROBST told not only of the problems which are presented at such an establishment but also the methods which are being utilized to keep them under control.

Chicago Section

AT THE meeting held October 28, 1943, the subjects "Program for Control of Benzol Poisoning" and "Prevention of Excessive Exposure to Hydrogen Fluoride in HF Alkylation" were presented. Under the former subject, DR. R. M. WATROUS, Plant Physician, Abbott Laboratories, North Chicago, Illinois, outlined a program for a light chemical plant, and DR. HAROLD H. STEINBERG, Physician in Charge, Medical Department, Peoples Gas Light & Coke Company, and Industrial Physician, International Harvester Company, Chicago, outlined a program for coke by-products production. Both of these men spoke from practical experience in the conception and conduct of an effective program for the prevention of poisoning where quantities of benzol are used or produced. The first of these papers has been published (See INDUSTRIAL MEDICINE, November, 1943).

Hydrogen fluoride has found its way into industrial operations in connection with a number of diverse processes—in aluminum metallurgy, in the coated rods of electric welders, and now in the petroleum industry. This latter industry is taking effective steps to assure, so far as possible, that its operators may avoid both the severe burns characteristic of hydrogen fluoride and also the possibility of systemic poisoning from prolonged exposure to it, as was ably described by ROY BENSON, Safety Engineer, Research & Development Laboratories, Universal Oil Products Co., Riverside, Illinois. MR. BENSON'S talk was illustrated by flow sheets showing the process and photographs of the several degrees of protective clothing used by the workers in these operations depending upon the extent of the hazard presented by the various operations. Mr. Benson's paper is published in this issue.

Electric arc welding was the subject covered at the December 2, 1943 meeting. DR. O. A. SANDER, Milwaukee, Wisconsin, gave his data on "Further Observation on Lung Changes in Electric Arc Welders." The engineering aspects of the subject were then covered. MR. E. A. WIBERG and MR. JAMES A. UMBARGER, Chief Engineer and Chief Electrician, respectively, of Pettibone-Mulliken Company, Chicago, discussed control of welding fume in industrial operations by means of a flexible duct system; MR. ROY M. MOFFITT, of the Roy M. Moffitt Company, Chicago, by means of a ventilated table; and WARREN A. COOK, Director, Division of Industrial Hygiene and Engineering Research, Zurich Insurance Companies, Chicago, by means of overhead hoods.

Michigan Section

THE Michigan Industrial Hygiene Society at its meeting on October 27, 1943, heard DR. FRANK F. TALLMAN, Director of Mental Hygiene, State Hospital Commission, Lansing, Michigan, speak on "Industrial Mental Health." DR. TALLMAN presented the subject from the industrial personnel rather than from the purely medical point of view. The problem of individual productivity and absenteeism is of great importance at the present time. Some of the causes of under production are not easily determined, and it is believed that the mental attitude of the individual worker may be a factor. Practical phases of this subject were brought out by DR. TALLMAN.

On December 8, 1943, DR. JOSEPH LO-PRESTI, Assistant Surgeon (R), U. S. Public Health Service, on assignment to the National Society for the Prevention of Blindness, New York City, addressed the Section on "Vision in Wartime Industry."

DR. PARKER HEATH, of Detroit, discussed DR. LO-PRESTI'S talk. Now, more than ever before, DR. LO-PRESTI pointed out, conservation of eyesight, correction of visual defects and adequate illumination must be recognized as important factors in industrial health maintenance programs.

Pittsburgh Section

AN INFORMAL round table discussion was held by the Pittsburgh Section on November 11, 1943, following the Annual Meeting of the Industrial Hygiene Foundation of America. Of the 50 men attending this session, about 30 were out-of-town guests many of whom were authorities in their respective fields of industrial hygiene. DR. CARLETON E. BROWN, of

the U. S. Bureau of Mines, served as Chairman. After posing a number of questions on various phases of industrial hygiene, DR. BROWN turned the meeting over to general discussion.

Among the most interesting of the items covered was the matter of silicosis and combined silica. There have been a number of publications recently pointing to the development of disabling lung disease due to dust of such materials as tremolite talc. DR. LEROY U. GARDNER, Director of the Saranac Laboratories, Saranac Lake, New York, stated that the mines in which tremolite talc was being obtained in Upper New York State contained, in certain areas of the workings, up to 20% quartz. Consequently he attributed the disabling lung disease ascribed to tremolite talc dust as actually being the result of the quartz content of the rock. In North Carolina also publications have pointed to the development of disabling lung conditions as a result of inhalation of combined silica from operations containing no quartz or other free silica. The lungs from one man who succumbed to the effect of such dust were referred to the Saranac Laboratories, where x-ray diffraction determinations of the ash from the lungs showed the presence of appreciable percentages of quartz. DR. GARDNER stated that evidence so far available indicates that, where a disabling lung condition is alleged to result from exposures to dust (other than asbestos) which contains only combined silica and no free silica, there is either an unsuspected presence of free silica in the dust, the victim has had a previous undisclosed exposure to free silica dust, or there has been inadequate interpretation of the x-ray.

As a constructive contribution to the matter of absolute particle size of dust in air, which has been a matter of much discussion and some controversy over the past several years, DR. DUDLEY A. IRWIN, Medical Director, Aluminum Company of America, disclosed some interesting findings on dust sizes as observed under the electron microscope at a primary magnification of 25,000 diameters. He stated that dust as collected from the air was in the great proportion less than 0.5 micron in diameter. It was pointed out that new information on dust available through the electron microscope may result in new standards for safe dust exposures.

Many other subjects of vital interest to the industrial hygienist were discussed during the evening, such as the relative value of lead in urine as a measure of exposure. MR. E. C. BARNES, Director of the Industrial Hygiene Technical Services of the Westinghouse Electric & Manufacturing Company, of East Pittsburgh, Pennsylvania, and JOHN B. LITTLEFIELD, Director of the Industrial Hygiene Laboratories of the American Brake Shoe Company, Chicago, have been making numbers of such analyses and have found close correlation between the results of urine and lead content and actual industrial lead exposures. The relative advantages of reporting results in terms of gammas per liter and of gammas per hourly excretion were discussed. This informal meeting was such a great success that it was the hope of all who attended that such an informal round-table meeting might be repeated on other occasions where industrial hygienists convene.

—*Continued from page 98.*

informed on the need for, or provision of, medical, hospital, or related services and benefits." But what's the difference, in propaganda? What price "truth," when something is being slipped over?...

ON THE constructive side, as to this comment, is the fine work the official industrial hygiene agencies are doing. Their record, like industry's, is one to be proud of, and no small part of their ability to make that record is due to their faculty for understanding the problems of those they are trying to help and cooperating in the methods and means of solution. They express an objective grasp of subjective factors and limitations which is admirable to say the least. Together with their fellows in industry, they are putting the techniques of prevention on a basis which is a fortuitous compound of science and humanism. How they come by these qualities is beside the point: the essential thing is that they possess them—perhaps in some measure as a result of professional training. . . . INCIDENTALLY DR. J. LYNN MAHAFFEY, New Jersey's Health Director, advises of a vacancy for an industrial hygiene toxicologist in that state's industrial hygiene service. Inquiries should be addressed to DR. MAHAFFEY, State Department of Health, Trenton 7.

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